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# ANNALS OF SURGERY

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A MONTHLY REVIEW  
OF SURGICAL SCIENCE AND PRACTICE

---

EDITED BY

LEWIS S. PILCHER, A.M., M.D.,  
AND  
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VOL II.

July—December, 1885.



ST. LOUIS:  
J. H. CHAMBERS & CO.,  
1885.



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# ANNALS OF SURGERY.

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## THE FIELD AND LIMITATION OF THE OPERATIVE SURGERY OF THE HUMAN BRAIN.<sup>1</sup>

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NINE years ago, while resident surgeon in a well known Philadelphia hospital, I watched a man die after a fracture of the cranium, and found at the autopsy, immediately under the fracture, a cerebral abscess, from the surface of which was extracted a piece of bone driven in at the time of injury. I had seen the vigorous man admitted; seen him first intelligent, scarcely sick perhaps; then confused and delirious, then comatose, and finally dead. As the elements of this human life were being successively extinguished by increasing destruction of nerve centres, the routine and approved medicinal treatment for encephalitis was steadily continued.

It took little surgical experience to recognize the lamentable result of the inactive, so-called conservative, treatment, which almost to a certainty sacrificed the patient's life. Do we, Mr. President and Fellows of this Association, know no better at this day than to allow life to be thus destroyed through an almost criminal neglect of the most evident indications for surgical interference?

The recollection of this case and of other similar ones has especially directed my attention to the importance of cerebral surgery; and it was with much pleasure that I accepted the president's appointment to prepare for this meeting a paper discussing the operative surgery of the human brain. The design of the paper is to indicate my views in such a succinct and categorical manner that the subsequent discussion may not

<sup>1</sup> Read by appointment at the annual meeting of the American Surgical Association, Washington, D. C., April 21st, 1885.

be discursive. The opinions and practice of the representative surgeons forming this body will thus, I trust, be so formulated that the profession at large may find in its Transactions definite rules of action. Dr. Moses Gunn,<sup>1</sup> and the present President, Dr. W. T. Briggs,<sup>2</sup> have at previous meetings given voice to their belief in more active surgical interference with pathological conditions of the brain. If their words had induced the profession to accept their conclusions, it is probable that I should not appear to-day to reiterate their thoughts. Since I began the collection of material for this paper, there has appeared the exhaustive article of my colleague, Dr. Charles B. Nancrede,<sup>3</sup> which leaves so little to be said that I was almost inclined to lay aside my pen.

Perhaps, however, constant agitation of the topic may at last gain for these surgical principles which I am about to advocate a wider professional acceptance. It is possible, indeed, that I may take a position rather more radical than that which the authorities mentioned will accept as justifiable. During my remarks I shall report some illustrative cases, but promise that no great amount of time shall be consumed in the relation of their details.

It will, perhaps, facilitate discussion if I at once announce the opinions that I hold upon more or less disputed points involved in the consideration of my subject.

My creed, if I may use the term, is as follows:—

I. The complexus of symptoms called "compression of the brain" is due not so much to displacing pressure exerted on the brain substance as it is to some form or degree of intracranial inflammation;

II. The conversion of a closed (simple) fracture of the cranium into an open (compound) fracture by incision of the scalp is, with the improved methods of treating wounds, attended with very little increased risk to life;

III. The removal of portions of the cranium by the trephine or other cutting instruments is, if properly done, at-

<sup>1</sup> Treatment of Fractures of the Skull, Recent and Chronic, with Depression, *Trans. Amer. Surg. Assn.*, Vol. I., p. 83.

<sup>2</sup> The Surgical Treatment of Epilepsy arising from Injuries of the Head, with special reference to the use of the Trephine, *Trans. Amer. Surg. Assn.*, Vol. II., p. 101.

<sup>3</sup> Injuries of the Head, *International Encyclopedia of Surgery*, Vol. V., pp. 1-109.

tended with but little more risk to life than amputation of a finger through the metacarpal bone ;

IV. In the majority of cranial fractures the inner table is more extensively shattered and splintered than the outer table ;

V. Perforation of the cranium is to be adopted as an exploratory measure almost as often as it is demanded for therapeutic reasons ;

VI. Drainage is more essential in wounds of the brain than in wounds of other structures ;

VII. Many regions of the cerebral hemispheres of man may be incised and excised with comparative impunity ;

VIII. Accidental or operative injuries to the cerebral membranes, meningeal arteries, or venous sinuses should be treated as are similar lesions of similar structures in other localities ;

IX. The results of the study of cerebral localization are more necessary to the conscientious surgeon than to the neurologist.

These propositions I shall consider successively :—

I. The complexus of symptoms called “compression of the brain” is due not so much to displacing pressure exerted on the brain substance as it is to some form or degree of intracranial inflammation.

Many have argued against the use of the trephine in depressed cranial fracture, because considerable depression may exist without interference with the cerebral functions and because “compression symptoms” frequently disappear after the lapse of a longer or shorter time, on account of the cerebrospinal fluid, as they put it, gradually becoming displaced or absorbed, and the circulation being restored to its natural condition,<sup>1</sup> and because deeper lesions beyond the reach of the trephine are frequently found in the fatal cases. Cure in these cases is supposed to occur by adaptation of the brain to the peripheral pressure. On the other hand, writers who favor more frequent operation have also clung to this compression theory, and have advocated perforation of the skull and elevation of the depressed bone for its relief. Their position has been assailed, and, I think, quite logically by those who use the line of argument mentioned above. Neither party seems

<sup>1</sup> H. B. Sands, *Annals of Anatomy and Surgery*, Vol. VIII. (1883), p. 104.

to see that the so-called "compression symptoms" after traumatism are not due to compression, but to some form or degree of inflammation. Let the profession repudiate the idea that brain displacement is the pathology of traumatic "compression of the brain," and many of the discordant opinions concerning the utility of trephining will be quickly harmonized. Some writers have, according to Stimson,<sup>1</sup> estimated that the constantly acting intra-cranial tension under normal circumstances is equal to from eight to twenty-five millimetres of mercury, and susceptible of temporary increase. This tension does in some instances overcome the displacement of the cranial vault. Duret,<sup>2</sup> after experimenting with injections of wax, states that a clot amounting to one-twelfth of the cranial capacity situated between the dura mater and the bone will cause coma and death in a few hours, but that in the arachnoid cavity a clot one-sixth or even one-fifth the bulk of the cranial cavity is requisite for a lethal effect. This results from the fact that in the latter case the wax moulds itself over a large surface, instead of being confined to one spot.<sup>3</sup> Lesion of the nerve centres must, of course, be absent. If this is true, how can any one believe that a square inch of bone depressed a quarter or a half of an inch will give sufficient pressure to cause cerebral symptoms, even if the presence of cerebro-spinal fluid does cause the external tension to be communicated to the entire cranial contents? Compression of the brain in cerebral tumors is the factor that causes many of the symptoms, but I am now speaking of surgical compression symptoms.

There are no definite symptoms by which we can distinguish accurately between laceration of the brain, contusion of the brain, and the so-called compression of the brain. Jonathan Hutchinson is almost correct in thinking that compression of the brain from depressed fragments of broken bone is an imaginary condition.<sup>4</sup> Briggs, with good reason, questions the view that secondary "compression symptoms" in intra-cranial suppuration are dependent exclusively upon the pressure of the

<sup>1</sup> *Treatise on Fractures*, p. 251.

<sup>2</sup> Quoted by Nancrede in *International Encyclopaedia of Surgery*, Vol. V., p. 64.

<sup>3</sup> See Review of *Études Expérimentales sur les Traumatismes Cérébraux*, by H. Duret, in *Brain* (1878), Vol. I., p. 106.

<sup>4</sup> Statement of Briggs, *Annals Anatomy and Surgery*, Vol. VII. (1883), p. 65.

pus. He suggests, and I agree with him, that the symptoms are more probably produced by the inflammatory process which caused the formation of pus.<sup>1</sup> Dr. Hunter McGuire,<sup>2</sup> on the other hand, said at a recent meeting of this body: "If the fracture is a simple one, and the depression is not sufficient to bring on symptoms of compression, it is better to wait and see if the brain will not be able to accommodate itself to this condition." Here he admits a belief in the pressure theory, though in the next sentence he says that "we all know that there is no relation between the amount of depression and the symptoms of compression." At the same time Dr. D. W. Yandell<sup>3</sup> gave as his opinion that we should not elevate the depressed bone unless symptoms of compression are persistent. These opinions were given, I admit, several years ago, and the speakers may have changed their views by this time; but I am sure that to-day such words would still be spoken by many surgeons. The idea that depression of bone causes "compression symptoms" by mechanical pressure is deeply rooted. It would be well if traumatic "compression of the brain" were always translated "inflammation of the brain," and the profession taught to believe it due to irritation of the brain periphery from the traumatic cause.

II. The conversion of a closed (simple) fracture of the cranium into an open (compound) fracture by incision of the scalp, is with the improved methods of treating wounds, attended with very little increased risk to life.

Uncertainty as to the character of a cranial lesion is more dangerous to health and life than the conversion of a closed into an open fracture of the skull, because observation has taught the profession that open cranial fractures do not resemble in fatality similar open fractures of long bones. If I but learn the character of the skull injury, I am acquainted with surgical expedients that render restoration to health more probable than the complication due to the incision renders it improbable.

Antiseptic methods have done away with much of the danger of open bone wounds as is shown by the frequent advo-

<sup>1</sup> *Loc. Cit.*, p. 67.

<sup>2</sup> *Transactions*, Vol. I., p. 92.

<sup>3</sup> *Transactions*, p. 97.

cacy of resection for ununited and for malunited fractures, and of osteotomy and similar operations for conditions not urgently demanding surgical interference. No surgeon would hesitate to convert a closed recent fracture of the thigh or leg into an open one if it were otherwise impossible to replace fragments which were threatening life. Hence I strongly advocate exploratory incision of the scalp in obscure injuries of the skull.

Some months ago a man who, it was said, had fallen from a heavy wagon, and had been run over, was admitted into my ward of St. Mary's Hospital. Behind the left ear was a large hæmatoma, where, it was asserted, the wagon wheel had struck him. My resident surgeon made a two inch incision, and removed the clots; but finding no fracture, closed the wound with sutures and applied corrosive sublimate dressing. The knowledge that no fracture existed, was very satisfactory, I can assure you. Three days later, the incision had healed up without suppuration except in a space of  $\frac{3}{8}$  inch, and the sutures were removed. Such rapid union without complication will not always occur, but it shows the possibility of little risk in the majority of cases.

I recently ligated the brachial artery and never dressed the wound after the hour of operation, because it was healed when the dressing was first removed. Such results of antiseptic surgery make us properly bolder than our predecessors, who feared to convert a closed fracture of the skull into an open one.

III. The removal of portions of the cranium by the trephine or other cutting instruments is, if properly done, attended with but little more risk to life than amputation of a finger through the metacarpal bone.

Much of the mortality attributed to trephining belongs to the serious brain-lesions that have accompanied the fractures for which trephining has been done, and to the absence of proper surgical antisepsis. Many patients have been trephined, and have undoubtedly died; but the opponents of trephining must show that cause of death lay in the operation itself. In deaths occurring from lesions for which trephining

is the admitted treatment, they must likewise show that the operation was done early enough to remove the causative factor of death before they can assert that the operation was unavailing. Gross, Michel and many others have frequently quoted historical facts and cases, which show the slight risk incurred by uncomplicated trephining. Briggs says: "My opinion, based on a large personal experience, is that trephining the skull is one of the safest of the capital operations of surgery."<sup>1</sup>

The opposite view, however, was held by Dr. H. F. Campbell, at a recent meeting of this Association, at which he said: "I have ever regarded trephining as one of the most serious of all capital operations."<sup>2</sup>

Nancrede,<sup>3</sup> from a careful investigation, gives a mortality of 10.69 per cent. as being a probably fair estimate of the risk of the operation, *per se*, and a death rate of 15.29 per cent. as an expression of the probable risk in trephining a simple depressed fracture. This author further says that his own experience has taught him that trephining is not a dangerous operation, and that more patients die from complications, that might have been prevented by timely operation, than from the removal of a disc of healthy bone.

Dr. R. W. Amidon, of New York, has collected 115 cases of trephining and kindred operations occurring since 1879. These operations were done for various causes, and were unselected by Dr. Amidon; nor did he confine himself to cases treated antiseptically.<sup>4</sup> Of these 115 unselected cases, 29 died; but of these, 25 presented, at the time of operation, symptoms endangering life, leaving therefore but 4 cases in which the fatal issue could be attributed to the operation. This gives a mortality of a little over 3 per cent. to the operation. He announces his reasons for considering the 25 deaths as not attributable to operation in the following words: "In six cases symptoms of abscess of the brain declared themselves before the operation, was performed. In five a meningitis ex-

<sup>1</sup> *Annals of Anatomy and Surgery*. Vol. VII., 1883, p. 65.

<sup>2</sup> *Transactions*. Vol. I., p. 94.

<sup>3</sup> *International Encyclopædia of Surgery*. Vol. V., pp. 94 and 95.

<sup>4</sup> *Annals of Surgery*, St. Louis, March, 1885, p. 205. See also his previous paper, *Medical News*, June 21, 1884.

isted at the time of operation. In four cases shock caused death; two died of hemorrhage from a branch of the middle meningeal artery (not wounded in the operation); one died of hemorrhage from the middle cerebral artery, severed by a stab wound of the head; one died of hemorrhage from a lacerated longitudinal sinus; one of galloping consumption, which was hereditary; one of pneumonia; one of extensive laceration of the brain; one of opium poisoning; and three I accept, on authority of the physician reporting them, as not dying from the effects of the operation."<sup>1</sup>

Yeo<sup>2</sup> trephined 26 monkeys under antiseptic precautions, and had only one death attributable to intracranial inflammation, though six other deaths from exposure to cold weather, chloroform poisoning or hemorrhage occurred among his cases. In some of the animals portions of the brain were excised. Of other monkeys trephined without antiseptic precautions, all died.

Much stress has been laid by some writers on the danger of wounding the membranes and brain with the trephine. With a conical trephine or the burr of the surgical engine as recommended by Dorr and myself,<sup>3</sup> there is no danger of this. Even if such an accident should occur to the membranes it is, in my opinion, of very minor importance, unless the damage is much greater than could occur except by gross carelessness. Dr. Gunn disapproves of the use of the mallet and chisel because he believes that the repeated shocks to the brain may prove injurious to the nerve tissues.<sup>4</sup> For removing large or irregular areas of bone the flat burr of the surgical engine is certainly much more accurate and desirable.

I have compared trephining with amputations through the metacarpal bone, because in both operations, there is exposure of cancellated bone structure. I do not know that the mortality of such finger amputations has been accurately computed, but it is certainly regarded by all as slight. It is seldom that

<sup>1</sup> This list accounts for the death of 26 instead of 25 patients, and apparently contains an error.

<sup>2</sup> *British Medical Journal*, May 14, 1881, p. 763.

<sup>3</sup> *Buffalo Medical and Surgical Journal*, XIX., p. 475. *Philadelphia Medical Times*, 1881-82, XII., 266.

<sup>4</sup> *Transactions*, Vol. I., p. 88.



patients are confined to the house after such amputations. Trephining in itself is, I am convinced, little, if any more hazardous. I believe that one of us trephined to-day, might, if it was necessary, go home without incurring any great risk to life; though I would not advise such a procedure. Amputation of the finger may be followed by erysipelas, septicæmia, or death; so may trephining, but it is not to be expected. The mortality of amputations of the thumb and fingers is, according to Ashhurst,<sup>1</sup> 3.3 per cent. This undoubtedly is less than the mortality of amputations through the metacarpus, because amputation of distal phalanges, which are almost without risk, are, of course, included. The same writer gives partial amputations of the hand a mortality of 6.6 per cent. If, therefore, we estimate amputation of a single finger through the metacarpal bone as having a mortality of 4 or 5 per cent. it will probably be nearly correct. According to the figures of Amidon, given above, trephining is actually much less dangerous to life than this.

IV. In the majority of cranial fractures the inner table is more extensively shattered and splintered than the outer table.

Many experimental fractures made in the dissecting room, and observation of cases in the practice of myself and of others, teach me that extensive shattering of the inner table, with only a moderate amount of fracturing of the external table, is of frequent occurrence in other as well as in punctured fractures. I admit that the condition in the cadaver, preserved by zinc chloride, with its shrunken brain, is different from that in the living; but there is much evidence of the same splintering to be found in the study of accidental and homicidal cranial fractures. This is in accordance with the well-known mechanical law that compressing force applied to the outside of a surface, as undoubtedly most fracturing forces applied to the skull are, tends to produce more extensive breaking of the inner surface. This is especially so in all localized blows. Punctured fractures have long been treated by early trephining, to avert encephalitis. For the same reason I recommend resort to trephining even in more diffused and less accentuated fractures.

<sup>1</sup> *International Encyclopædia of Surgery*, Vol. I., p. 637.

It is to prevent inflammatory sequences due to splinters forced into the membranes and brain, and to avert the consecutive occurrence of epilepsy and insanity, that the operation should be performed; not because of the fear that symptoms of compression of the brain may arise, nor because necrosis of detached portions of bone may occur.

Sometimes there is no fissure in the outer table, though the inner table is extensively broken and depressed. Twenty such cases are reported as having occurred during the late civil war.<sup>1</sup> All of these patients died from intracranial inflammation except one in which the splintered portion of the brain table was removed as a sequestrum. Prescott Hewitt and Lidell have furnished other statistics of such cases.<sup>2</sup>

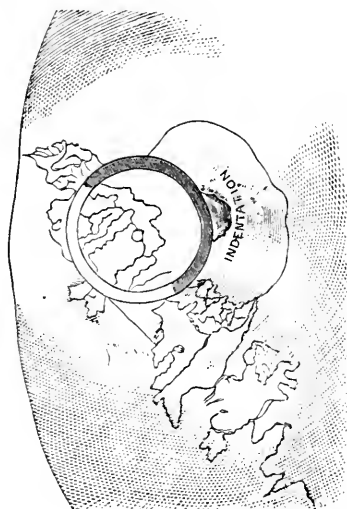


Fig. 1. Outer surface of fractured skull.

I show you a piece of skull removed from a patient who recently died under my care. He was struck with a pitcher which caused a small scalp wound, through which my finger tip felt rough bone. I enlarged the incision, came upon a very rough surface, due to unusual irregularity of the lambdoidal suture with small Wormian bones, and found only a small dent or fissure looking much like the entrance for a vein. I determined

<sup>1</sup> *Med. and Surg. History Rev.*, Pt. I., Surgical Volume, p. 150.

<sup>2</sup> *Holmes's System of Surgery*, Am. Edition, 1881. Vol. I., p. 636.

to do exploratory trephining because of the nature of the vulnerating force. Dr. George Dock, under my direction, cut out a disk of bone close to the external dent at the position which was thought would give best access to any splinters. Nothing was found but a small fissure crossing the inner surface of the disk. A probe slipped between the inner table and the dura disclosed no irregularity; therefore, no further operative steps were taken. A portion of the inner table left in the bottom of the trephine-hole was undisturbed because it was smooth. The patient died in about 42 hours of delirium tremens. Dr. H. F. Formad, the pathologist, found no inflammation of brain or meninges, but intense œdema of the brain and membranes, and at the inquest swore that death occurred from alcoholic delirium. The section of bone presented to you shows a marked



Fig. 2. Inner surface of fractured skull.

depression of the table due to a **T**-shaped fracture under the seat of the external dent, beneath which was a small clot upon the dura mater. The top line of the **T**, which in the figure is vertical, is  $1\frac{1}{4}$  inches long. The cleansed bone shows what was not seen at the time of operation, because the surface was at that distance from the wound left covered by periosteum, a semi-elliptical fissure of the external table encircling the slight dent. It would have been better if the trephine had been ap-

plied directly over the external dent instead of alongside of it. It is well, therefore, to follow that well-known rule in such cases as this, and also to employ a large trephine. Where a mere entrance for the elevator is desired, a small trephine should be used.

If this patient had lived he would have been very liable, I think, to epilepsy or insanity. Only a few weeks ago I saw, in consultation with Dr. Charles K. Mills, a man of 22 years, who was suffering with marked mental impairment occurring, as he and his brother said, subsequent to a fracture of the skull received about four years previously. Reference to the notes of the Pennsylvania Hospital, in which he had been treated, showed that he had been admitted for a compound depressed fracture of the skull, which was so slightly marked that operation was not deemed necessary. It is probable that his mental impairment was due to a depression similar to that seen in this specimen. It was my intention to trephine in this case of mental failure if further investigation of his condition by Dr. Mills conclusively traced the aberration to the injury. Unfortunately the patient passed out of our control by returning to his country home before I had a second opportunity of examination.

I feel sure that the element of danger in skull fractures is this splintering of the inner table; and I differ most decidedly from those who esteem it of comparatively little importance. Its danger in those abruptly depressed fractures called punctured fractures has been quite generally recognized; but its great frequency and risk in other forms of fracture are still not sufficiently emphasized by all authorities. Ashhurst in the last edition of his *Surgery* dated 1882,<sup>1</sup> says in speaking of simple depressed fractures: "I have never seen a case of this kind in which I thought the use of the trephine justifiable, nor an autopsy which showed that the operation could possibly have saved life."

Concerning compound depressed *impacted* fractures he would not advise operation "even if symptoms of compression were present." He goes on to say that the trephine "is not to be used with the idea of relieving compression, nor with the idea that there is any special virtue in the operation to prevent encephalitis." In punctured fracture the same distinguished sur-

<sup>1</sup> *I*p. 325 and 326.

geon thinks the trephine may be necessary to slightly enlarge the opening in the skull to remove the spicules which are apt to be broken from the more extensively involved internal table; but says: "It is better to leave imbedded in the brain, a foreign body, or even a fragment of bone, than to add to existing irritation by reckless attempts at its removal."

Perhaps Dr. Ashhurst has changed his views within the last two years. If he has not, I must disagree with him on this subject; except in the opinion that reckless surgery is always unjustifiable. His definition of what constitutes reckless surgery may differ from mine.

Many writers while admitting the probability of greater damage to the inner table, do not give its disastrous consequences sufficient stress. Briggs,<sup>1</sup> however, truly says, that the great danger in depressed fracture is not compression, but inflammation set up by displaced fragments of bone. Dr. Sands says<sup>2</sup> that advocacy of early trephining on the ground that loose pieces of bone in simple comminuted fracture will probably become necrosed and set up fatal intracranial inflammation, is improper. I believe that few advocates of early trephining give necrosis as a reason for their belief. Necrosis is not, but encephalitis is, very liable to occur.

Dr. Sands also believes that the apprehensions felt by those who advocate preventive trephining in closed depressed fracture, without head symptoms, with the object of removing sharp fragments of the inner table, are scarcely justified by observation. These extensive osseous lesions are, in his opinion, often recovered from, without surgical interference. He states that<sup>3</sup> immediate resort to the trephine is imperatively required, however, in fractures of limited extent and in which there is reason to think, from its situation or the occurrence of monoplegia, monospasm, or hemiplegia, that a splinter has penetrated the motor area of the cortex. Trephining is also demanded, in Dr. Sands's opinion when compression of the brain is due to blood between the dura and cranium.

V. Perforation of the cranium is to be adopted as an explor-

<sup>1</sup> *Annals of Anatomy and Surgery.* Vol. VII., p. 69.

<sup>2</sup> *Annals of Anatomy and Surgery.* Vol. VIII., 1883, pp. 101-103.

<sup>3</sup> *Annals of Anatomy and Surgery.* Vol. VIII., 1883, p. 106.

atory measure almost as often as it is demanded for therapeutic reasons.

I have shown that the occurrence of fatal encephalitis is frequently due to spiculation of the inner table, and that spiculation or extensive shattering of the inner table is common in limited fractures of the external table. Hence it follows that exploratory perforation of the cranium is justifiable in all cases where the nature of the impinging force or the appearance of the external table renders spiculation of the inner table probable; provided that less danger to life and health is inherent in perforation than in the probable spiculation. I have already asserted my belief in, and given reasons for, a low mortality risk of perforation. I am of the opinion that fractures of the cranial vault produced by such general application of force as occurs when a man falls from a great height upon his head, are less frequent than fractures by direct and comparatively localized blows such as occur from missiles, bullets and falls from low elevations. These latter are those which tend to produce internal spiculation. Hence I am driven to the conclusion that exploratory perforation to determine the absence or presence of internal spiculation is often demanded by the uncertainty of the invisible condition. Without a knowledge of the true state of affairs treatment is empirical; and the risk to subsequent mental health or to life is too great to permit reliance on empirical treatment when a knowledge of the true condition is obtainable with the slight danger that pertains to antiseptic trephining.

Whenever the fracture, whether originally an open one or so made by my incision, presents the possibility of the inner table being detached and splintered more extensively than the outer, I should be inclined to advise perforation. In other words I would cut the scalp to see the condition of the outer table and I would cut the bone to see the condition of the inner table, in every case where the risk of obscure knowledge is greater than the risk of divided scalp and perforated bone.

The tendency to procrastination in such matters has destroyed many lives. Nancrede<sup>1</sup> recommends early preventive trephining strongly, because, after encephalitis has once

<sup>1</sup> *International Encyclopedia of Surgery*. Vol. V., p. 95.

begun, trephining does not remove the inflammation, but merely one source of irritation without influencing the existence of the inflammatory process which has been aroused. His statistics show the mortality of the operation, after symptoms of brain disease have arisen, to be much more than twice as great as in preventive operations. The figures are 52.8 per cent., and 22 per cent. He further says that although the operation should be done early, it is never too late to make the attempt in neglected cases; for an abscess may be found and evacuated with the result of saving life. Stimson<sup>1</sup> says that the percentage of recovery in early operative interference is actually high compared with tardy operations; and cites instructive cases to prove that his opinion is correct. Wound of the longitudinal sinus and removal of about three square inches of bone was no bar to recovery in a case which he treated by immediate trephining, though no brain symptoms except stunning were present.

VI. Drainage is more essential in wounds of the brain than in wounds of other structures.

That drainage is as essential in wounds of the brain as in wounds of other structures would seem to be a self-evident proposition; and yet gunshot and other wounds of the skull and of the cerebral membranes and hemispheres have long been treated as if drainage was not a necessary factor in therapeutics. A surgeon who would think himself censurable to leave the opening leading into a suppurating cavity obstructed by shreds of skin and fascia, will, with profound equanimity, see his patient die with pus burrowing among the vital centers of the brain. There may be but a small fissure or opening, or perhaps none at all, in the bony wall enclosing the brain, and but a mere puncture in the tense dura mater, yet he will hesitate to give free exit to the pus. We split open a knee joint, we incise a pleural, peritoneal, or pericardial cavity to give free egress to pus; so must we cut away the cranium and incise the dura mater in analagous conditions. The greatest error in this connection has perhaps been in an expectant instead of an operative treatment of bullet wounds of the brain.

<sup>1</sup> *Treatise on Fractures*, p. 248.

Stimson,<sup>1</sup> in speaking of the trephine, says: "Most writers upon surgery during the last twenty or thirty years condemn its use unequivocally except in compound fractures with depression and with marked and persistent cerebral symptoms." A very few writers could be mentioned who are not included in the class spoken of by Stimson, but who have advocated more frequent use of the trephine in such skull fractures as are seen in civil practice. The hesitation to employ the trephine in gunshot fractures, however, has been almost universal.

This is, I think, very erroneous doctrine, for death from abscess is very common after bullet wounds of the brain. The fracture is compound, the suppurative process recognized as almost certain to occur, and yet no provision of moment has, according to the usually pursued treatment, been made for drainage and antisepsis.

In a considerable number of open fractures of the cranium of a linear kind pus has been found at the autopsy beneath the bone or membranes. The danger of an early trephining in such cases would have been less than that resulting from the imprisoned pus. The mere line of fracture establishes a direct communication, between the air and the membranes, which may lead to suppuration. Such communication is, of course, much more extensive in gunshot fractures and comminuted fractures. In cases, therefore, where there is reason to believe that suppuration will occur, trephining may be beneficial for purposes of drainage. I do not advocate perforation in all linear fractures which are not subcutaneous; but advise it when there is such strong probability of suppuration as is the case in nearly all gunshot fractures.

The statistics of H. R. Wharton,<sup>2</sup> concerning foreign bodies lodged in the brain show the importance of removal when possible. Of 106 cases in which removal was accomplished, only 34 died; of 210 cases, in which no attempt at removal was made, 122 died. The death rate here was doubtless largely due to want of proper drainage.

While preparing this paper I assisted Dr. R. J. Lewis in a case which will illustrate this phase of my communication.

<sup>1</sup> *Treatise on Fractures*, p. 247.

<sup>2</sup> *Philadelphia Medical Times*, July 19, 1879.



A young man of 19 years was shot in October, 1884, with a pistol of 22 hundredths calibre held about a foot from his head. The ball entered the skull at a point about  $1\frac{1}{2}$  inches behind and  $2\frac{1}{4}$  inches above the cartilaginous attachment of the left ear, taking a direction slightly downward. He fell senseless, but soon reacted. The next day when seen he had no fever, no palsy, no strabismus, no abnormality of pupils, and no intellectual obscurity. Towards evening, however, his sight began to decrease, and by the morning of the second day after the accident he was totally blind, and had no pupillary reaction to light. Dr. A. H. McAdam asked Dr. Levis to assist him in the treatment of the case. A probe carefully inserted into the skull entered for a distance of about  $3\frac{1}{2}$  inches. The following afternoon (third day) Dr. Levis trephined for the purpose of affording free drainage and of attempting extraction of the bullet, which he thought he possibly felt with the probe. An opening was made, the membranes incised, and several spicules of bone extracted from the cerebral hemisphere into which they had been driven by the ball. The brain substance was already so broken down that it oozed out before the disc of bone was cut entirely loose, and the full length of my little finger was readily carried into the brain wound. The ball, being not readily found, was not searched for very long. On the next day (fourth) the patient could distinguish the hand passed before his eyes. Two days later he could see to roughly tell the time by a large clock hanging across the small room.

After the lapse of two more days, according to the notes of the case, he could tell the minutes indicated by the clock, which had a dial about ten inches in diameter, and was about six feet distant from him. Vision seemed better in the left than in the right eye, and when looking he closed the right eye, as if some diplopia existed. Free suppuration from the wound continued, no marked febrile action occurred, and subsequently he became able to tell time by a watch. Nine weeks after the injury there occurred an abscess at the site of the trephining, but three months subsequent to the shooting he was attending to his business in good health, though the wound had not yet cicatrized. He could see well. I saw the patient only at the time of the operation, and have taken these facts from notes obtained by Dr. C. L. Bower.

I examined this patient in April, 1885, six and a half months after injury. He was in good health, weighed 20 pounds more than usual, drove a wagon which he loaded with baskets and bundles, and had as good a memory as ever for numbers, names and words. No failure in this respect was noticed by him in his occupation of delivering goods. He had no headache, and no tenderness or pain at the cicatrix in the

scalp. I found that his left ear heard my watch tick at 24 inches, while his right heard it at 42 inches. This defect in hearing he had observed, and seemed to attribute it to the injury. He whistled well, but protruded the tongue with its tip a little to the left. No loss of tactile sense did I discover in testing sensation of the fingers with the points of a pair of compasses. He never observed trouble in vision before the injury, but said that now he could not read the newspaper well. The pupils reacted to light, and were not dilated nor contracted. The right eye showed vision  $\frac{20}{6}$ , not perceptibly improved by spherical lenses or the stenopæic hole; the left eye  $\frac{20}{LXX}$ , not perceptibly improved by spherical lenses or the stenopæic hole. He read D1.25 at  $4\frac{1}{2}$  inches with difficulty, which convex lenses did not remove to any marked degree. No diplopia was noticed by him when looking at lights or stars. No strabismus and no insufficiency of the internal rectus muscles were observed by me. There was, however, hemianopia of both eyes when a pencil was held to the right of the middle line of each eye. The sense of smell in each nostril was apparently unaffected, for he easily distinguished carbolic acid from cologne water. On each side of the tip of the tongue he readily distinguished tannin from chloride of ammonium. I regret that I had not a good opportunity of examining the ears and eyes with otoscope and ophthalmoscope.

While admitting that similar cases might have recovered without operation, I doubt its probability; the spicules driven into the brain, the softening therein already begun, and the profuse suppuration through the perforation make me believe that early death from intra-cranial abscess would have killed the patient rapidly if no operation had been done.

Agnew<sup>1</sup> quotes MacLeod as saying that in the Crimean war, of 67 gunshot fractures of the skull, in which the skull was penetrated, one hundred per cent. died. Agnew himself gives a table (p. 288) of 486 cases of penetrating gunshot fracture, with a mortality of 85.5 per cent. These high death rates are largely, I believe, due to inefficient drainage; but also to splintering of the inner table and driving of the splinters into the brain substances. Dr. S. W. Gross is quoted by Dr. S. D. Gross as showing in over seven hundred cases of gunshot wounds of the skull only 25+ per cent. of recoveries by expectant or conservative treatment, but 41+ per cent. recoveries after operative treatment; or a difference of about 16

<sup>1</sup> *Principles and Practice of Surgery*, Vol. I., p. 287.

per cent. in favor of operative interference. These statistics of Gross<sup>1</sup> were published eighteen years ago, and would probably be improved by the present operative methods.

Drainage of cerebral abscesses and wounds by tubes or horse hair has been successfully performed on several occasions. Noyes<sup>2</sup> passed a drainage tube through a traumatic abscess in the frontal lobe, utilizing the trephine hole and the orbit for its entrance and exit. In this case death occurred. The four cases of similar operative treatment reported by Burchard, by Fluhner,<sup>3</sup> by Fenger and Lee,<sup>4</sup> and Kemper,<sup>5</sup> all recovered. Dr. J. P. Thomas,<sup>6</sup> of Kentucky, reports a case of cerebral abscess, which he successfully treated in 1875 by drainage obtained by position and the use of tents made of strands of silk.

These cases are sufficient to prove the truth of my sixth proposition.

VII. Many regions of the cerebral hemispheres of man may be incised and excised with comparative impunity.

Physiological experimenters know well that the lower animals bear, without serious risk to life, ablation of quite large areas of the brain substance. Although clinical experience has shown the same fact respecting the human brain, surgeons have not been sufficiently impressed with the circumstance. They have looked upon the brain and its membranes very much, as until recently, they looked upon the heart and pericardium—a region never to be approached with trocar or scalpel. Many patients have died of brain abscess or brain tumor, because the timidity of the surgeon prevented the introduction of an aspirating needle or knife to open the pus cavity, or the employment of enucleation for the detachment of a neoplastic growth. This is partly due to the ignorance of surgeons respecting the localization of cerebral functions.

<sup>1</sup> *System Surgery*, Ed. 1882, Vol. II., p. 71, from *Am. Jour. Med. Sciences*, October, 1867.

<sup>2</sup> *Am. Jour. Med. Sciences*, July, 1882.

<sup>3</sup> *Med. News*, January 10, 1885, and *New York Med. Journal*, March 28, 1885.

<sup>4</sup> *Transactions*, 1884, and *Am. Jour. Med. Sciences*, July, 1884.

<sup>5</sup> *Am. Jour. Med. Sciences*, January, 1885.

<sup>6</sup> *Med. News*, February 14, 1885.

Nancrede reports<sup>1</sup> a remarkable case, in which a patient who was thought to be dead from cerebral abscess following penetration of the skull by a knife, was restored to consciousness by a second trephining and incision of the brain substance. An aspirator needle had previously been passed several times into the brain to the depth of two-thirds of an inch through the first trephine hole, but no pus had been passed. After the incision had evacuated one or two fluid ounces of pus the man revived and lived till the sixth day.

Dupuytren, Detmold, J. F. Weeds, Hulke and others have reported recoveries after incision of the brain and evacuation of abscesses.

Nancrede finds out of thirty cases of cerebral abscess treated by operation a mortality of only 50 per cent. I do not know in how many of these cases the brain substance was incised or punctured in the search for pus.

Amidon<sup>2</sup> states that of 100 cases of operation on the head, collected by him during recent years, the dura mater was opened in 33, by either the injury or the surgeon. These gave a mortality of 39.3 per cent.; but he states that in only one death could the fatal issue be directly ascribed to the exposure of the cerebral convolutions, and therefore he gives the mortality of operation inducing exposure of the hemispheres of the brain as 7.6 per cent. As showing the tolerance of the brain substance to injury, he quotes, among others, the following recent cases, of which he gives the various sources, as below mentioned.

*Fluhrer's case.* A bullet entering at a point about four centimetres above the left eye, a little to the left of the median line, pierced the first frontal convolution, traversed the brain backwards and a little outwards, and emerged from the upper part of the parietal lobule, where it lay slightly imbedded in the brain. The symptoms were not alarming. The course of the bullet was ascertained by careful probing, and the trephine was applied over the supposed site of the ball. After a short search it was found, and a drainage apparatus composed of horse hair and catgut passed through the entire track of the ball. The operation was done with antiseptic precautions, and the wounds were dressed with iodoform. Recovery was uninterrupted and complete. The slight weakness of the right hand and loss of memory rapidly disappeared.<sup>3</sup>

<sup>1</sup> *International Encyclopedia of Surgery*, Vol. V., p. 83, and *Transactions*, 1884.

<sup>2</sup> *Medical News*, June 21, 1884.

<sup>3</sup> Case of Dr. Wm. F. Fluhrer, unpublished, quoted by permission given Dr. Amidon; since published with most valuable remarks in *New York Medical Journal*, March 28, 1885.

*Olpherts' case.*<sup>1</sup> The whole of the right parietal, parts of the right occipital, temporal, and left parietal bones was torn away, with extensive laceration and loss of cerebral substance. The case was treated antiseptically without operation, and recovered perfectly.

*Wood's case.*<sup>2</sup> A man was struck by the pilot of an engine, and his head cut open from the inner canthus of the left eye to the occiput. A furrow eight centimetres long was cut in the anterior lobe of the left hemisphere. Under cold applications he recovered.

*Hoskins' case.*<sup>3</sup> A boy six years of age was stepped on by a horse. The left side of the head was crushed in, blood, bone and brain escaping. Blood and pieces of brain exuded from left ear. It was estimated that 62 cc. of cerebral substance were lost. There were three compound fractures. There was a right hemiplegia, which disappeared, and aphasia, which improved.

These cases certainly prove the truth of my seventh proposition, as would also seem self evident from the occasional continuation of life and even of comparative health during the existence of large areas of brain softening or suppuration, or of large substitutive growths in the cranial cavity.

VIII. Accidental or operative injuries to the cerebral membranes, meningeal arteries, or venous sinuses, should be treated as are similar lesions of similar structures in other localities.

Numerous cases have recently been reported that prove this assertion. W. T. Bull<sup>4</sup> obtained good results in two cases after suturing the divided dura mater with catgut; Parkes<sup>5</sup> had a cure following lateral suture of the superior longitudinal sinus; W. Hopkins,<sup>6</sup> of Philadelphia, recently treated successfully a profuse hemorrhage from the superior longitudinal sinus, after removing comminuted bone, by pressure with a pad of lint sprinkled with iodoform; Sands<sup>7</sup> applied pressure to a wounded superior longitudinal sinus; Brinton<sup>8</sup> has applied lateral ligature successfully to the lateral sinus; Nancrede<sup>9</sup> has

<sup>1</sup> Olpherts, *Br. Med. Jour.* (1882), II., 89.

<sup>2</sup> Wood, *Am. Jour. Med. Sciences*, July, 1881, LXXII., 168.

<sup>3</sup> Hoskins, *Lancet* (1883), II., 99.

<sup>4</sup> *Archives of Medicine*, Vol. I. (1879), p. 219.

<sup>5</sup> *Annals of Anatomy and Surgery*, Vol. VIII. (1883), p. 118.

<sup>6</sup> *Annals of Surgery*, July, 1885.

<sup>7</sup> *Annals Anatomy and Surgery*, Vol. VIII. (1883).

<sup>8</sup> *Philadelphia Medical Times* (1881), Vol. XII., p. 577.

<sup>9</sup> *Philadelphia Medical Times*, March 8, 1884, Vol. XLV., p. 440.

successfully ligated the middle meningeal artery. Numerous other cases of this sort might be cited, but enough have been quoted to prove my proposition.

[To be continued.]

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## AN EXPERIMENTAL AND CLINICAL STUDY OF AIR-EMBOLISM.

[Continued.<sup>1</sup>]

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### VIII. IMMEDIATE CAUSE OF DEATH AFTER INTRA-VEINOUS INSUFFLATION OF AIR.

VARIOUS theories have been advanced to explain the injurious effect of the presence of air in the circulation. Bichât (*Physiological Researches on Life and Death*, p. 186) attributed death resulting from intra-venous injection of air to cerebral anæmia produced by the presence of air in the cerebral vessels, asserting at the same time that a very small quantity would suffice to produce this effect. As the first argument in favor of this view, he claims that the heart continues to beat for some time after the cessation of animal life. Secondly, air injected through one of the carotids produces death in the same way as when introduced into the veins. Thirdly, the cases reported by Morgagni, where death was attributed to the presence of air which was found in the cerebral vessels at the post-mortem examination, and which was supposed to have developed there spontaneously. Fourthly, all examinations after death revealed the presence of frothy blood, mixed with air-bubbles, in both ventricles. Fifthly, air

<sup>1</sup> Continued from Vol. I., p. 549, June, 1885.

injected into one of the divisions of the portal vein produces no ill effects until it reaches the general circulation. Sixthly, the almost instantaneous death observed in some instances is due to the acceleration of the heart's action, and consequently the rapid conveyance of air into the cerebral vessels. Seventhly, the existence of convulsions, which he ascribes to the irritating quality of the air on the brain. He summarizes as follows: "We shall conclude that in the accidental mixture of air with the blood of the venous system, it is the brain which dies the first, and that the death of the heart is the consequence of the death of the brain."

Magendie, in commenting on Bichât's views concerning the manner of death from intra-venous injection of air, remarks: "This is not correct, and death takes place, on the contrary, by the cessation of the motions of the heart. The right ventricle is filled with air, and this air, dilated by heat, so distends it that it can no longer contract." Magendie also claims that small quantities of air in veins will not result in death, and that life is in jeopardy only when the air is injected suddenly and in considerable quantity. He relates the details of an experiment which he made on a horse, where he injected in rapid succession into the veins of the animal 40 syringes full of air, and three syringes full into the carotid artery. The capacity of the syringe was 17 centilitres. The animal died three minutes after the last injection. At the examination of the body, he found the air in the azygos vein and in the thoracic duct, which contained much lymph, as well as in the lymphatic vessels of the internal surface of the lungs. The heart was enormously distended with air, mixed with a small quantity of blood. Morgagni, Brunner, Sprægel, and Nysten referred the cause of death to the same source—over-distention and paralysis of the heart. When death is not produced by the mechanical effect of the air on the heart, then the consecutive symptoms were referred by Nysten to an obstruction of the lungs, produced by the accumulation of air in the ultimate divisions of the pulmonary artery. He observed that the embarrassment in respiration often appears as late as twelve hours after the introduction of the air, and becomes greater and greater; the bronchi are filled with a viscid fluid, and the ani-

mal usually dies on the third or fourth day. In such instances no air was found in the heart or the vessels; but the lungs, instead of being pink colored, were grayish, tinged with brown and loaded with frothy blood and mucus. The same views were entertained by Bœrhave, Kettler, and Beck. In such cases death results from asphyxia from the mechanical obstruction to the passage of the venous blood through the pulmonary circulation. Mery accepts the views of Mercier, published in 1839, who attributed death to this, that the blood, mixed with air, becomes frothy, enters the pulmonary capillaries, and obstructs them. Physicists are aware that a capillary tube, which readily admits the passage of air or water, offers a great resistance to a mixture of air and water; this mixture causes a series of bubbles separated by minute septa of liquid. Poiseuille has shown by a series of experiments that such, in fact, is the cause of death whenever air mixed with blood has obstructed the pulmonary capillaries. The right heart remains over-distended, and cannot be emptied.

Blundel (*Medico-Chir. Trans.*, Vol. IX., p. 65) studied the effects of the intra-venous injection of air in his experiments on transfusion of blood. He injected 5 drachms of atmospheric air into the femoral vein of a small dog in quantities of a drachm each at a time, without any serious effects. The symptoms observed were sighing respiration, irregular pulse, muscular tremors and vomiting, all of which, however, subsided after a brief space of time, and the animal recovered completely in three days. A second experiment was made on the same animal by blowing three drachms of pulmonary air into the femoral vein, without even producing much *temporary* inconvenience. He concluded that it seemed indisputable that small quantities of air may be introduced into the circulation without destroying life. Dr. Haighton made the same experiment with intra-venous injection of air, with like results. A series of experiments were made by Panum (*Experimentelle Beiträge zur Lehre von der Embolie*, Virchow's Archiv., Vol. V., p. 499). The subject of the first experiment was a small dog, in which five cubic centimetres of air were injected into the lower portion of the jugular vein. No symptoms followed immediately after the operation. Four days subsequently the



weight of the animal was reduced from 3540 to 3030 grammes. The tissues around the point of puncture were inflamed. On the fifth day the animal was killed. The skin of the animal was dotted with spots of ecchymosis, resembling the extravasations as they occur in the disease known as morbus maculosus Werlhofii. In the vicinity of the wound the tissues were emphysematous, emitting an offensive odor. Among other post-mortem appearances, the lungs presented several gray superficial stripes and spots, one-half line in diameter. In the middle of several of these patches were found empty spaces, which Panum regarded as encysted air-bubbles. In addition, small isolated nodules were also found, which contained in their interior small bubbles of air. These nodules contained also numerous nuclei and fat-globules. In the second experiment 10 cubic centimetres of air were injected into the lower portion of the jugular vein of a small one-year-old dog. During the first three days nothing was observed with the exception of rapid emaciation. On the fourth day the animal began to loose the hair, not only in the vicinity of the wound as in the first case, but over the entire surface of the body. Later, inflammation and ulceration attacked the point of operation. On the eleventh day the animal was killed. The lungs again presented sub-pleural nodules, from the size of a pin's-head to that of a grain of sand, in which could be found large cells filled with fat molecules, granular cells, and fat—globules in large number. Air could not be found in any of them, and their relation to the capillaries of the pulmonary artery could not be determined. In the third experiment, 30 cubic centimetres of air were injected into the jugular vein, without producing any alarming symptoms, except rapid and deep respiration. The next day no change was observed, but on the following day the animal was found dead. A careful examination revealed punctiform extravasations in different portions of the brain, stomach and liver. The wound showed a healthy appearance. The lungs contained many very small yellowish white nodules and points of extravasation, one to two lines in diameter. The hemorrhagic infarcts contained each a minute cavity filled with air. The nodules also contained air. From these experiments it appears that

the air emboli which passed through the pulmonary capillaries produced local disturbances in the minute vessels in the skin and gastro-intestinal canal, while the air emboli in the ultimate branches of the pulmonary artery gave rise to circumscribed foci of inflammation. Picard (*Sur les injections de l'air dans la veine porte*, *Gaz. Méd. de Paris*, No. 6, 1873) found after insufflation of air into the portal vein intense hyperæmia in the distal portion and radicles of the vessel, the same as after ligation. At the commencement of the insufflation, the blood pressure in the femoral artery and one of the rectal veins was about the same; but after a while the pressure in both was simultaneously diminished, but the positive pressure lasted longer in the vein than in the artery. The action of the heart was increased, the respirations became slower and the temperature in the rectum was gradually reduced. As an interesting physiological fact it is mentioned that after insufflation of air into the portal vein no sugar could be found in the liver, and the fibrin in the portal blood was diminished. The experiments of Magendie, Bouillaud, and later, those of Couty (*Etude expérimentale sur l'entrée de l'air dans les veines*, Paris, 1875) proved conclusively that in cases of entrance of air into a peripheral vein the air collects almost exclusively in the right side of the heart; only a minute quantity entering the left side through the pulmonary capillaries. Referring to this question, Flint says: "The production of death from air in the veins is purely mechanical. The air finding its way to the right ventricle is mixed with the blood in the form of minute bubbles, and passed into the pulmonary artery. Once in this vessel, it is impossible to pass through the capillaries of the lungs, and death by suffocation is the inevitable result if the quantity of air be large. It is because no blood can pass through the lungs that the left cavities of the heart are usually found empty." (*Physiology of Man, Blood, Circulation, Respiration* (1866), p. 323.) If the quantity of air introduced is small, or the entrance repeated in small quantities, the air collects in the capillaries of the pulmonary artery, as air emboli, obstructing the circulation in the impacted vessels, but a sufficient number of vessels remain pervious to maintain the circulation, and life is prolonged until

the equilibrium of the circulation is restored by the absorption of the adventitious air. No traces of air are found in the arteries, only a small quantity passing into the venæ cavæ through the tricuspid valve, which has been rendered insufficient by the presence of air. When a considerable amount of air has entered the right ventricle of the heart, mixed with the blood, the air is separated from it, and its specific gravity being less, it rises to the highest point of the chamber in contact with the anterior walls; besides it expands, and by its over-distention it impairs the muscular contractility, which even in a normal condition is insufficient to empty the cavity completely. The impediment to the circulation being the presence of the large air embolus in the right ventricle, which, on account of the higher temperature, increases in volume, sudden death will take place in the diastole by an arrest of the heart's action from paralysis by over-distention. If the animal escapes instantaneous death from this cause, the heart is inadequate to force the blood from the right ventricle through the pulmonary circulation, as its efforts are expended in compressing the air; only a minute quantity of blood being forced into the lungs. In proportion as the amount of air and blood in the right ventricle increases, the right side of the heart is expanded, and the volume of blood in the lungs and the left heart is diminished. At last the distended walls of the heart prevent perfect closure of the tricuspid valve, giving rise to venous pulsation, a constant symptom in all cases of air-embolism, which prove rapidly fatal. On the advent of this complication the intra-arterial pressure in the pulmonary and peripheral arteries diminishes, which further enfeebles the pulmonary circulation; at the same time it produces acute anæmia of the brain, and death results from anæmia of the brain or asphyxia. Such is the mechanism of death in cases of entrance of air into the venous circulation, and, at the same time, it offers an explanation why in these cases the air is found mostly in the right side of the heart and the large venous trunks. These facts also corroborate the observations of experimenters that certain animals succumb more readily to the presence of air in veins than others. The tolerance of intra-venous air is most marked in animals with

well developed respiratory organs and a proportionately powerful right ventricle. In horses, for example, the volume of the right cavity is smaller and the muscular structure more powerful—circumstances which explain the fact that entrance of air into the veins of these animals does not easily kill them. The circulatory apparatus of the dog offers the least resistance to intra-venous air. Key blowed air into the jugular veins of horses after venesection without producing death. Small amounts of air produced no result whatever, and a volume of air equivalent to two expirations proved fatal only in debilitated animals. Some animals remained well after leaving a canula in the jugular vein for several hours. Death was sure to follow if, after insufflation of air, the vein was ligated. Animals who have previously lost large quantities of blood readily succumb to intra-venous admission of air.

Laborde and Muron, who studied the effects of intra-venous and intra-arterial insufflation of air, placed great stress on the manner in which the injections are made in determining the gravity of the symptoms. They observed that in case the insufflations into veins are made slowly, and repeated at intervals, large quantities were tolerated without exciting serious symptoms. If, on the other hand, they were made suddenly and with force, and the quantity of air was considerable, death resulted almost instantaneously from arrest of the heart's action in the diastole, an occurrence which was attributed by these authors to over-distention of the right side of the heart.

In repetition, it may be stated that the immediate cause of death after intra-venous injection of air has been referred by different experimenters to:—

1. Mechanical over-distention of the heart and paralysis of this organ during the diastole.
2. Acute cerebral ischæmia.
3. Asphyxia from obstruction to the pulmonary circulation subsequent upon embolism of the pulmonary artery.

#### IX. INTRA-ARTERIAL INSUFFLATION OF AIR.

As the accidental admission of air never takes place in wounds of the arteries on account of the high degree of intra-

vascular pressure, and the absence of any aspiratory force, it is not surprising that the effect of the artificial introduction of air into these vessels has been made less frequently an object of experimental research than intra-venous insufflation of air. The subject is devoid of any practical value, and the interest attached to it is purely of a scientific nature. As we have already seen, Bichât entertained the idea that atmospheric air acts as a direct irritant to the substance of the brain when brought into contact with that organ through the medium of the cerebral vessels, and death from insufflation of air whether into veins or arteries, was invariably attributed by him to cerebral anæmia. Panum (*Op. Cit.*), in his researches on embolism, made arterial insufflation of air also a subject of experimentation. A rapidly fatal termination followed the injection of 40 centimetres of air into the lower portion of the carotid artery of a medium-sized dog. The infundation was superseded immediately by severe general convulsions, alternated by violent attacks of rage. The animal foamed at the mouth, and had involuntary discharges from the bladder and bowels, the eyes became prominent, and the pupils, at first dilated, contracted and remained so, permanently. The animal soon became quiet and motionless. Respiration and heart's action slow. The right anterior and both posterior extremities were extended, and rigid, while the left front leg remained relaxed. Conjunctiva insensible, while touching the cornea, produced contractions of the eyelids. For two hours the animal remained in a condition resembling anæsthesia, without changing its position, with slow pulse and respiration, when life ceased without a tremor or convulsion. The post-mortem examination showed numerous punctiform ecchymoses in the gastro-intestinal mucous membrane, the liver, diaphragm, and abdominal muscles. The superficial vessels of the brain, more particularly the veins, were extremely hyperæmic; the jugular veins were distended to their utmost with blood. The small arteries contained many air-bubbles, so that the smallest vessels presented varicose dilatations which resembled a string of pearls. The large vessels at the base of the brain also contained air, and numerous red spots were disseminated throughout the white substance of the brain.

Laborde and Muron (Virchow u. Hirsch's *Jahresbericht*, 1873, Vol. I., p. 268), witnessed after the introduction of 20–60 c. cm. of air into the carotid artery of dogs, when injected in a peripheral direction, that death was produced rapidly and was always preceded by tetanic convulsions and labored respiration; while, if the quantity of air was thrown in, in divided doses, the animal often survived the experiment for 24 hours. In the latter class of cases the operation was followed by tetanus, vomiting, paralysis, and coma. The autopsy revealed softening of the brain, and capillary hemorrhages, especially in the middle portion of the brain, the medulla oblongata, and in the posterior lobes of the cerebrum. The intra-arterial insufflations of air in all these experiments were immediately followed by grave cerebral symptoms, which can only be interpreted by the constant post-mortem appearances,—air embolism of the cerebral vessels, and extreme ischæmia of the brain. The presence of air in the arteries, or the left side of the heart, is followed by an entirely different series of phenomena than in the veins or the right side of the heart. The acute ischæmia of the brain thus induced, is invariably manifested by tetanic rigidity of the voluntary muscles, and almost complete suspension of the respiratory movements of the chest. The contractions of the left ventricle are so powerful as to overcome these additional impediments, and to completely evacuate the chamber. The air is expelled as soon as it enters, and is distributed throughout the whole arterial system. It must be readily conceived that the air when it has reached the aorta will rise into the carotid arteries, and thence into the cerebral vessels, distending them to their utmost capacity. In such instances death results from sudden cerebral anæmia before the air can gain entrance into the venous system through the capillaries. That the presence of air is detrimental to the nervous system has been established by experiments on animals. Bohnius attributed to the air, when introduced into the vascular system, poisonous properties, and this opinion is entertained by Neudörfer, even at the present time. Copeland believed that the oxygen of the adventitious air combines with the carbonic oxide in the venous blood producing carbonic acid. These and similar theories do not explain

the phenomena observed after insufflation of air. The symptoms during life, and post-mortem appearances, point directly towards physical obstruction in the blood vessels by air emboli which suspends the function of one of the vital organs and consequently must be regarded as the immediate or direct cause of death. Insufflation of air into the carotid artery towards the brain is almost immediately fatal. If a moderate quantity of air is forced through the arterial system into any other organ except the brain, except by forming a temporary obstruction in the circulation, it does no particular harm, and is in a short time removed by absorption. This fact may have induced Flint to make the following remarks concerning this subject (*Op. cit.*, p. 324): "Air injected into the arteries produces no such serious effects as air in the veins. It is arrested in the capillaries of certain parts, and in the course of time is absorbed without having produced any injury."

The danger arising from the introduction of air into the arteries or left side of the heart, arises from obstruction to the circulation through the cerebral vessels by air-emboli and the cessation of the functions of the brain consequent upon an almost complete ischæmia of this organ. The mechanical distention of the left side of the heart, by the accumulated air, is overbalanced by the powerful contractions of the left ventricle, which are sufficient to empty the chamber almost completely, and to force the air into the ultimate distributions of the arteries, causing acute anæmia in distant organs, but more particularly in the brain. In these instances the air is forced directly into the cerebral vessels either by the injecting force or the powerful contractions of the left ventricle, and if death takes place it follows as the direct result of acute cerebral ischæmia.

#### X. CLINICAL STUDY OF AIR-EMBOLISM.

All physiologists agree that regular and deep inspirations produce a powerful aspiration in the large veins near the base of the heart, more particularly in the jugular and subclavian veins. This fact is so well known that the base of the neck and the clavicular regions are frequently referred to as the "danger-zone." During the inspiratory act the chest expands,

and the flow of venous blood is accelerated towards the cardiac or proximal side. A diversity of opinion still exists among authors in regard to the distance to which this force directly affects the venous circulation. Experiment and clinical observation have shown that the danger of entrance of air into wounded veins is increased as the wound approaches the heart. Berard studied the anatomical conditions of the vessels where entrance of air has most frequently taken place, and he came to the conclusion that this accident can only happen in the event when a wounded vessel is empty, and its walls are prevented from collapsing, and the wound remains patulous. He found these conditions normally present in the sinuses of the dura mater, the hepatic veins, the superior vena cava, the internal jugular, the subclavian, and the axillary veins, because the walls of all these vessels are firmly fixed to the adjacent tissues, which prevents their collapse on being wounded. It has further been shown that the admission of air is favored by pathological conditions which affect the veins in a similar manner, as the existence of induration of their walls, the result of chronic inflammation, or infiltration by neoplasms. Experience has corroborated these views, inasmuch as it has been shown that this accident has occurred most frequently in operations in the vicinity of veins which, from their anatomical location are prevented from collapsing by firm and unyielding layers of fascia and vessels which are, or have become, adherent to unyielding tissues. Again, it is always very justly feared in removing tumors which have become adherent to large veins, as the morbid process frequently has impaired the normal resiliency of the vessel so as to keep its lumen patent in the event it is wounded during the dissection.

In 33 cases of intra-venous aspiration of air collected by Couly (*Op. Cit.*) air entered the external jugular nine times, the axillary eight times, the internal jugular five times, the subscapularis three times, the facial twice, the anterior jugular twice, the occipital twice, and twice one of the anterior thoracic veins in close proximity to the clavicle. In 1864 Green collected 67 cases where air had entered a vein during an operation. The greater number of cases occurred during extirpation of tumors in the region of the neck, chest and



axilla. Twice the accident took place in disarticulating the humerus at the shoullder joint (Cooper, Delpech); once, on extirpating the scapula and clavicle (Mussey); twice, on tying the subclavian artery (Clemot, Rigaud); three times on bleeding from the external jugular vein, three times from bleeding from median vein, and once on passing a seton-needle through the tissues in the region of the neck. Among the wounded veins, the external jugular is mentioned thirteen times, the internal jugular ten times, the subclavian and axillary, each, once. In the remaining cases the vein is not specified or the injury involved a branch in close proximity to the specified vessels. (*Amer. Jour. Med. Sciences* (1864), p. 38.) All causes which interfere with the free return of venous blood prevent the admission of air, while, on the other hand, all influences which promote the venous circulation, such as an unimpaired *vis a tergo*, regular deep inspiration, and the force of gravitation predispose to this accident. Soon after Beauchène made known his case, the Royal Academy of Medicine of Paris appointed a commission to investigate the subject. In the report it is stated, that the results of the experiments, which were made, principally on dogs, had proven that the conditions necessary to determine the entrance of air consisted in making the wound in the vein anywhere within the area of the venous pulse, or, at any rate, only a short distance from it. If the wound was located at a greater distance and beyond the influence of the venous pulsations, no air would enter, although the wound was kept open. The experiments were also to determine the extent of the venous pulse, and the conclusions arrived at were that the brachial and axillary veins were beyond the venous wave, while the subclavian and lower third of the jugular veins were the seat of pulsations, consequently wounds of the veins in these localities were liable to admit air. The sound produced by the entrance of air is described as resembling the lapping of a cat or dog, and that it always occurred during, and synchronous with, inspiration; but sometimes, when it was heard more frequently, it accompanied the diastole of the right ventricle. After the air had entered the vein, the sound, which could be heard on auscultation over the heart, was described as a "bruit de soufflet," synchronous with

the action of the heart. In regard to the effect of the aspirated air, it was decided that, in order to produce a fatal result, it was not only necessary that the amount of air introduced should be considerable, but that it must be thrown into the vein with some degree of force.

Hertwig called special attention to the fact, that aspiration of air is not as frequent an accident as is generally supposed, and that for its occurrence it is necessary that the peripheral flow of blood to the wound must be obstructed; that the edges of the vein wound must be drawn apart; and finally, that even the introduction of a canula into the vein is necessary to admit a sufficient amount of air to produce serious results.

The first case of admission of air into a vein that was recognized and verified by a post-mortem examination, occurred in the practice of Beauchène, and is described by F. Magendie (*Physiological Researches on Life and Death*, by X. Bichât, with notes by F. Magendie; Translated Boston, 1827, p. 188). As the case is of great historical and scientific interest, I will relate it as described by Magendie: "A locksmith, 23 years of age, had for five years a large tumor on the right shoulder and clavicle. His acute sufferings induced him to enter the hospital to have it removed. It was necessary, in the operation, to remove the middle portion of the clavicle. Thus far the success was complete; but little blood was lost, the pulse was good, and the breathing easy, when the patient suddenly cried out: 'My blood is leaving my body! I am dead!' At the same moment he became stiff, lost his consciousness, and was covered with a cold sweat. A singular and rather loud noise was heard in the interior of his chest. The surgeon thought he had opened the pleura by removing a portion of the clavicle, and thus given access to the air, and to the blood to the right side of the thorax. The fingers of an assistant were immediately thrust into the bottom of the wound, with a view of stopping the supposed opening in the pleura, and the surgeon endeavored to introduce into the thorax the extremity of a sound of gum-elastic. When he thought that he had succeeded, he drew with his mouth the air which he supposed to be effused in the plura. He wished then to proceed to the dressing, and, in order to do this, he substituted

for the fingers of the pupil, which were at the bottom of the wound, a sponge covered with wax; but the moment the sponge took the place of the fingers, the same noise that was at first heard, and which had ceased in an instant, was renewed with more force than before. The syncope and cold sweat still continued. Water thrown into the face made him give some signs of life, but he died a quarter of an hour after the appearance of the accident I have first described, and forty-five minutes after the commencement of the operation. The body was examined the next morning. They expected to find the right pleura open, much blood and air effused into its cavity, and the lungs on that side collapsed. Nothing of the kind was found. The pleura was whole and there was no effusion in it. The lungs were as usual, but an opening of half an inch in extent was discovered in the external jugular vein, at the place where this vein opens into the subclavian. The cavities of the heart were large, but contained no blood. Bubbles of air were observed in the vessels of the brain, the other vessels were not examined."

In order to study some of the conditions under which air has been aspirated into veins, and for the purpose of ascertaining the effects of such accidents in man, I will introduce a number of well authenticated cases which will represent a great diversity in the point of entrance, and will also aid in the establishment of the fact that this accident can occur outside of the regions of venous pulse, and always occurs during inspiration, and is never produced by the aspiratory function of the heart.

*External Jugular.* Barlow's case. (*Med. Chir. Trans.*, Vol. XVI., p. 29.) The patient was a female, suffering from a tumor seated on the side of the neck, which had been increasing in size for several years; its base was extensive, and occupied the whole of the lateral and posterior parts, extending from the ear to near the sternum, and sidewise from the thyroid gland to the sterno-mastoid muscle under which a part of the tumor was situated. The patient was seated in a reclining chair, supported by assistants. Two superficial elliptical incisions, ten inches in length, were made downwards from a little below the ear, "when on proceeding to dissect the skin aside to get at the

basis of the tumor, a sudden and unexpected hissing and gurgling noise rushed obviously from a large, divided, empty vein, and the patient expired instantly, without either sigh, groan, or struggle, and every effort to restore animation became fruitless." The divided vein appeared larger than the normal external jugular, but the reporter believes that it was this vessel or an anomalous vessel greatly enlarged. As the incisions must have traversed the external jugular, according to his own description, it was undoubtedly this vessel which was injured. It is distinctly stated that the vessel was flabby and empty, and that the instant the atmospheric air gained access and filled the vacuum, the hissing noise ceased. The patient expired, and the mouth of the vessel collapsed.

*Remarks.* In this case the admission of air was favored by the dilatation of the vein, and the semi-erect position of the patient. The latter factor produced the emptiness of the vein. The instantaneous death without any symptoms preceding it can only be explained by the fact that the air entered with force, and in large quantity the right ventricle and arrested the heart's action by over-distention.

*Internal Jugular.* Ulrich's case. (*Rust's Chirurgie*. Berlin, 1836, Vol. XVII., p. 565.) The operation was performed for the removal of a tumor involving the left side of the neck. It was found that the tumor was attached to the deep muscles of the neck, and in severing its connection the internal jugular vein was opened. No hemorrhage followed, the vessel remained open like an artery, and air entered immediately. The patient fainted, twitching of the muscles of the face, opisthotonos, a few slow respirations followed, and the patient was dead. The vein was found obliterated above the incision, and thickened and more resistant than normal where the wound was inflicted. The reporter attributed the ingress of the air to aspiration of the heart, and death to paralysis of this organ.

*Remarks.* The pathological changes in the vein above the wound interrupting entirely the column of blood from above as well as the thickening of the incised vein-walls were potent factors which determined the entrance of air. As this operation was performed before anaesthetics were used, we may be

almost certain that the patient was in a sitting or half reclining position during the operation, thus favoring greatly venous return and ingress of air. The entrance of air in this instance is brought, in connection with the suction power of the heart, by the author, in accordance with the then prevalent doctrine of the French Commission.

*Internal Jugular.* Dupuytren's case. (*Med. Chir. Trans.*, Vol. XVI., p. 301.) The operation consisted in the removal of a tumor of a fibro-cellular character of considerable size from the neck of a female 22 years of age. No serious obstacles presented themselves until the last deep attachment was severed with the knife, when suddenly a prolonged hissing noise (*soufflement prolongé*) was heard, resembling the sound produced by the entrance of air into a vessel from which it had been exhausted. The patient immediately proclaimed: "I am dying," and instantaneously dropped down on the floor, a lifeless corpse. As no other cause was found which could, in any way, account for the sudden death, the fatal issue was attributed to the entrance of air into the internal jugular vein. The following account of the post-mortem appearances fully warrant this supposition: The right auricle was distended with air like a bladder, which rushed out when cut open, without any admixture of blood. Fluid blood was found in the different vessels. Great quantities of air were found in all the vessels. There was no other unnatural appearance in any other part of the body.

*Remarks.* The editor of the *Medical and Surgical Review* explained the entrance of air in this case as follows: "It proves that the heart acts as a sucking as well as a forcing pump, otherwise air could never have passed from a cut vein in the neck down into the right chambers of the heart. It is highly probable that, in consequence of the morbid state of the parts, the mouth of the cut vein had remained patulous, and thus readily admitted the air." As no mention is made of the occurrence of hemorrhage, the vein was probably empty, a condition which might have been owing to the position of the patient during the operation, or the pressure of the tumor. It is also reasonable to assume that, on account of the intimate connection of the tumor with the vessel, the former so altered

the structure of the latter, as to prevent closure of the wound, all of these causes combined resulting in aspiration of air during inspiration.

*Facial Vein.* Mott's case. (*Ibidem*, p. 32.) The operation consisted in extirpation of the parotid gland, the seat of a scirrhus tumor. The facial vein was opened, where it passes over the base of the lower jaw, in dissecting the integuments from the tumor in the early stage of the operation before a single artery was tied. At the instant this vessel was opened, the attention of all present was arrested by the gurgling noise of air passing into some small opening. The breathing of the patient at once became difficult and laborious, the heart's action violent and irregular, his features were distorted, and convulsions of the whole body soon followed to so great an extent as to make it impossible to keep him on the table. He lay upon the floor in this condition for nearly half an hour, as all supposed in *articulo mortis*. The convulsions ceased gradually, his mouth was distorted, and complete hemiplegia was found to have taken place. After an hour had passed he could speak, but the use of his arm and leg was only recovered completely after the lapse of a day.

*Remarks.* Although not stated, it was undoubtedly true, that, in this instance, the facial vein was enlarged, and its walls had lost their normal resiliency, thus favoring the ingress of air. This case is also of interest, as from the predominance of the cerebral symptoms, it is apparent that some of the air must have passed through the pulmonary circulation and have gained access into the cerebral vessels from the left ventricle, giving rise to symptoms of cerebral embolism which disappeared as the air was absorbed.

*Axillary Vein.* Bransby Cooper's case. (*Med. Chir. Trans.*, Vol. XXVII., p. 41.) The patient was a female, 19 years of age, who was the subject of a malignant tumor of the right humerus, which required amputation at the shoulder joint. The operation was done by making a double flap, the subclavian artery in the meantime being compressed against the first rib. There was no loss of blood. The subclavian artery was secured, compression being kept up, as there were small vessels which required ligation. As

the operator was removing an enlarged gland from the axilla he heard distinctly a peculiar gurgling noise, like air escaping with fluid from a narrow-necked bottle. At the same moment the patient fell into a state of collapse which threatened immediate death. The face was deathly pale, the pupils fixed and insensible to light, the pulse small and fluttering, at intervals irregular, respiration hurried and feeble, and at irregular intervals, attended with a sigh. The patient was placed in the recumbent position, the flaps closed, and stimulants applied; but an hour elapsed before she had sufficiently recovered to be removed from the operating table. Subsequently, when placed in bed, she maintained a constant motion of alternate flexion and extension of the right leg, which continued for several days, at the same time she complained of pain, extending up the right side of the neck and head. The next day the pulse varied from 140 to 150 per minute, and remained the same for two days. She gradually rallied and recovered completely.

*Remarks.* In this case the axillary vein was divided at a point where its walls are firmly fixed and its lumen kept patent by dense connective tissue, which surrounds the vessel, a condition which predisposes to aspiration of air. Pulmonary air emboli obstructed the passage of blood through the lungs, a circumstance which would serve to explain the rapid respiration and the accelerated action of the heart, until the obstructing cause was removed.

*Axillary Vein.* Courvoisier's case. (*Correspondenz-blatt fuer Schweizer-Aerzte*, 1880, p. 205.) The operation was performed for the removal of a recurring cancer of the breast, and included the extirpation of infiltrated and ulcerated axillary glands. As the dissection reached the upper margin of the mass of axillary glands a lapping (schluerfend) sound was suddenly heard; at the same time the patient, a robust woman, 58 years of age, sank into a condition of collapse. The central portion of the vein was at once closed by digital compression, and artificial respiration with the administration of stimulants were successful in restoring her after the lapse of half an hour. Both ends of the vein were ligated, and the central ligature included the forceps which was allowed to remain. The patient recovered.

*Remarks.* In this instance the entrance of air was again determined by the anatomical location of the vein-wound to which may have been added cancerous infiltration of the parivascular tissues which rendered the vein walls still more unyielding. The amount of air admitted must have been small, to judge from the evanescent nature of the symptoms which followed.

*Anterior Thoracic Vein.* Amussat's case. (*Gazette des Hôpitaux*, July 6, 1837.) The patient was a woman, 47 years of age, suffering from a scirrhus affection of the right mammary gland and the subjacent and surrounding tissues. The breast and adjacent tissues had been removed, and the operator was dissecting towards the opposite side, when suddenly, on making an incision into some suspicious granulations on the inner side of, and below, the left clavicle, he and three other surgeons who were assisting him, heard a sudden, distinct, interrupted sound, as of air passing into a cavity through a narrow opening. The patient exclaimed: "I am dying," and appeared to be suffocating. A repetition of the same sound convinced the operator that air had entered through a wounded vein, and he placed his finger on the spot from which the sound proceeded. The patient's condition became critical; a cold sweat covered her face, her eyes were turned upwards, and all around her thought her dying. The orifice of the wounded vein could be distinctly seen. The chest was compressed with a view to force out the air from the vein, the wounded spot being compressed during the expansion of the chest. The patient soon began to show signs of improvement, when the operation was completed and the vein with a portion of the tissue was tied. The patient recovered completely.

*Remarks.* Although the particular vein wounded in this instance is not specified, it was undoubtedly a branch of the subclavian vein, the wound being in close proximity to the latter vessel. This case furnishes a good illustration of the fact that veins of comparatively small calibre, when wounded near their proximal termination into a large vessel may serve as points of entrance of air under the same circumstances as when the principal trunk is injured.

*Superficial Cervical Vein.* Trélat's case. (*British Med.*



*Journ.*, March 16, 1872.) Mr. Trélat related at a meeting of the Société de Chirurgie of Paris, an important case in which sudden death occurred in a patient from whom he was proceeding to remove a submaxillary tumor. The patient turned ghastly pale, and the heart's action ceased suddenly. Artificial respiration and electrization of the phrenic nerve induced some respirations and a slight return of color after fifteen minutes, but ineffectually. At the post-mortem examination a small vein opening into the external jugular was found to have been partially divided; in the jugular was a long clot interspersed with air-bubbles, and other bubbles of air were found in one of the mediastinal veins, and the posterior cardiac vein, and a very notable quantity of air in the right chambers of the heart.

*Remarks.* Several members of the society argued that death in this instance was due to the anæsthetic and not to the entrance of air into the vein. Roux and Giralès claimed that in several cases of death from chloroform they had found gases in the heart, in the vena cava, and even in the veins of the pelvis, but M. Depaul, in reply, properly and forcibly pointed out that the air in this case occupied only the veins going to the heart and the wounded vein.

*Femoral Vein.* The only well authenticated case of aspiration of air into the femoral vein that I have been able to find is recorded in the "Medical and Surgical History of the British Army in Turkey and the Crimea," Vol. II., p. 277, and refers to the sudden death from this cause of a soldier who had suffered amputation of the thigh. Three and one-half days after the operation he died suddenly without any obvious cause. At the necropsy, twelve hours after death, it was ascertained that the right cavities of the heart were distended with a mixture of blood and air, and the same condition was found in the two iliac veins and the inferior vena cava.

*Remarks.* As the time which had intervened between the operation and the fatal accident was more than three days, it is necessary to assume that the venous thrombus had been removed by suppuration, thus opening the vein for the admission of air, or that the supposed air found in the heart and vessels was not air, but gas which had developed in the wounded

parts, and had gained entrance into the venous circulation. This latter supposition is strengthened by the statement that the surfaces of the flaps were separated by gaseous products, and that the femoral vein was not closed, but lay open on the surface of the stump.

*Internal Saphenous Vein.* Warren's case (*Gazette Médicale*, No. 52.) The operation was done for the removal of a tumor from the inner surface of the thigh. In the dissection the internal saphenous vein was wounded; the event was promptly announced by an audible and distinct sucking sound produced by the entering air. No alarming symptoms followed, as the further ingress of air was promptly prevented by closure of the vein.

*Uterine Veins.* That the entrance of air into the uterine veins might be a cause of danger after parturition, was suggested by Legallois in 1829. Dr. John Rose Cormack read a paper on this subject before the Westminster Medical Society in 1850, when he gave the details of three cases that had occurred in his neighborhood. Many authorities doubt the possibility of admission of air into the uterine veins after labor. Julius M. Klob (*The Pathological Anatomy of the Female Sexual Organs* (1868), American Translation) alludes to this subject as follows: "I have not seen a case which convinced me that air had passed into the open veins of a recently delivered uterus, and I cannot conceive the mechanical possibility of such an occurrence. Bessems, Lionet, Lever, Wint- rich, Berry and Simpson assert that they have met with such instances, and a sufficient number of well authenticated cases have been placed on record which leave no further doubt as to the possibility of sudden death in puerperal women from entrance of air into the uterine sinuses. In a recent number of the *Wiener Medicinische Zeitschrift*, Braun gives three fatal cases from the introduction of air into the uterine veins; in two of the three the uterine douche was used, in one to produce abortion, in the other after delivery of twins, and the patients died in a short time, one indeed, within twenty minutes. Post-mortem examination showed air in the uterine veins, in the ascending vena cava, and in the veins of the heart. The third case was that of a woman who had been

delivered lying upon her left side, and was then turned upon her back; massage was made over the uterus, she gasped and died in a few minutes. Braun suggests that in the change of position a volume of air entered the uterus, and the manipulation, instead of driving it out, forced it into the uterine veins. Bischoff refers to two cases that came under his observation (*Correspbl. f. Schweizerärzte* (1880), p. 206). Dr. Draper (*Boston Med. and Surg. Journal*, January, 1883) has reported two cases where instant death occurred from efforts to cause criminal abortion. The post-mortem examination proved in each case the presence of air in the veins.

Mr. George May (*British Med. Journal*, June 6, 1857) reports three cases which occurred in his vicinity. The patients died respectively, six hours, and eight days after delivery, and in all of them post-mortem examinations showed the presence of air in large quantities in the inferior vena cava and the right side of the heart. An interesting account of this accident is given by Dr. Geo. Cordwent, and relates to a case that came under his observation (*St. George's Hosp. Reports*, Vol. VI.). His patient was 26 years of age. During the delivery, at full term, her expulsive pains became urgent, and, at her request, she was permitted, in the presence of her medical attendant, to remain standing; after a few severe pains the child was expelled, and, after falling on the floor, dragged with it the whole placenta. Almost immediately afterward a kind of gurgling sound was heard by the attendants, but, whether it arose from rumbling in the bowels they could not say. The patient remained about one minute standing, as before, and holding on to the bed-post; she then cried out: "I can't see! I feel faint! Lay me on the bed!" and expired almost instantly. At the necropsy, 24 hours after death, it was shown that the uterus externally presented the normal appearances of a recently delivered organ, except that a portion of the wall of its fundus to about the extent of a five shilling piece was slightly more puffy than the other portions, and, on cutting into it, air-bubbles escaped. There had been no laceration of the placental surface; the uterine cavity contained only one small clot; its lining membrane was healthy. The coronary vein of the stomach was distended; the right side of the heart was

slightly gorged, and when the auricle was punctured air-bubbles escaped with the blood which it contained.

Davidson (*The Lancet* (1883), Vol. I., p. 999) reports the case of a Hindoo woman who had been admitted into the Kaira Gaol Hospital, and safely delivered of a female child. The labor was in every respect normal. The placenta came away at the usual time, and there was no post-partum hemorrhage. About three-quarters of an hour afterward the woman died without any apparent cause. There had been no hemorrhage or convulsions. The patient had been taking some nourishment, when she suddenly fell back and expired. At the post-mortem examination, two hours after death, the uterus was found empty, with large and somewhat distended veins; the right side of the heart contained a quantity of air, mixed and churned up with blood, which escaped in bubbles; the lungs were congested, all the other organs were normal.

The most interesting and convincing case is related by Ols-hausen. It is the most convincing on account of the painstaking and accurate post-mortem examination which was made to determine the cause of death. (*Monatsschrift f. Geburtskunde*, January, 1865; *Amer. Journal Medical Sciences*, July, 1865.) A robust secundipara, aged 29, was delivered at full term. The uterus was unusually distended; no albumen in urine. The labor was lingering, and the uterine douche was used. The water of 30° R. was forced into the vagina gently by a pump. A third injection was made by a midwife. After eight minutes' use the patient began to complain of oppression. The tube was withdrawn. The patient rose in bed, immediately fell back senseless, and died in less than a minute under convulsive respiratory movements and distortion of the face. Eight minutes later, bleeding by the median vein was tried, but only a few drops flowed. On touching the body, distinct and widespread crepitation was felt. Autopsy eight hours after death. A large quantity of dark fluid blood escaped from the sinuses of the dura mater. The cerebral membranes very hyperæmic, brain normal, lungs somewhat congested, heart lying transversely, apex in fourth intercostal space. Left ventricle in firm contraction, right quite soft, something like an intestine with thick walls; the coronary vessels contained a quantity of

air-bubbles. Left heart contained only a small quantity of blood; the right held little, but it was frothy. The distended uterus crepitated everywhere on pressure under the hand. A number of subperitoneal vessels of medium size were plainly filled with air. The right broad ligament was strongly distended with air-bubbles, and this emphysema of the cellular tissue extended from the broad ligament through the retroperitoneal space to the inner side of the right kidney, and even below the liver to the inferior vena cava. *The inferior vena cava was enormously distended*—it was at least an inch in diameter—containing mostly air. The uterus was divided in the median line; a placenta was attached to the anterior wall; a small flap was detached from the uterus. A second placenta was attached behind and to the right; a larger portion of this had been separated, so that there was a sort of a pouch between it and the anterior wall. The two ova were uninjured. The air had gained access into the veins at the placental site. It was concluded that the tube had been passed into the uterine cavity, and that air had been thrown in with the water by the pump.

It would be difficult to conceive in what manner air could be drawn into the uterine veins by the aspiratory movements of the chest or heart, as is the case in the veins about the apex of the chest. Another explanation must be sought for, and this will be found in the change of structure, and the relations of the uterine veins. The veins during pregnancy keep pace with the enormous physiological hyperplasia of the uterine tissues, and are gradually converted into large sinuses, more especially the vessels at the placental site; they are simply excavations or channels in the contractile muscular walls of the uterus, their size being subject to the state of the uterine walls, whether at rest, relaxation or contraction. When the placenta is detached, some of the sinuses are laid open, and in a normal condition their calibre is obliterated by the contractions of the uterus and the formation of thrombi. If from any cause air should reach the uterine cavity, it may be aspirated into the uterine sinuses by relaxation of the uterine contractions, and, having gained access into them, it is readily forced into the circulation by subsequent contractions, the uterine walls acting

the part of a suction and forcing pump. During forcible uterine contractions the veins are nearly emptied of their contents, and, as the organ relaxes, the walls of the veins are distended and a vacuum is formed, which is filled with blood or air. Should the relaxation be slow, the empty spaces are readily filled with blood or serum in the absence of air, but if the uterus relaxes quickly, the suction power is proportionately greater; and, in the event air has reached the uterine cavity, it is aspirated into the open veins, and by reaching the right side of the heart through the vena cava it gives rise to the same train of symptoms as when it is admitted into a vein during a surgical operation in the regions of the neck.

*Pulmonary Vein.* Dumin's case (*Berliner Klin. Wochenschrift*, January 30, 1882.) This is the only case on record where it is claimed that death was produced by the entrance of air from a pulmonary tubercular cavity through the pulmonary vein into the left side of the heart. The patient was a young man suffering from pulmonary tuberculosis in the last stage. Physical diagnosis revealed a large cavity in the apex of the right lung. After the patient had been in the hospital for three weeks the general condition remained about the same, while the local destructive process had been progressing. One day after eating his dinner, he arose from his bed, fell down, and expired almost instantly without uttering a word or sound. At the post-mortem examination, 24 hours after death, it was found that the apex of the lung contained a cavity of considerable size, beside extensive crude infiltrations. The left lung contained numerous nodules and three small cavities. The third cavity in the substance and near the base of the lung contained a small amount of blood intimately mixed with air-bubbles. The heart was slightly dilated. The left ventricle was filled with blood mixed with innumerable small air-bubbles. The right cavity also contained air, but in much lesser quantity. All the larger arteries contained air mixed with blood; air-bubbles were also found in the venæ cavæ and the pulmonary artery. The arteries and veins in the brain and meninges were found distended almost exclusively with air. No signs of advanced putrefaction could be found, and none of the parenchymatous organs contained gases. The reporter explained

the sudden death by the entrance of air from the small cavity in the left lung, which contained spumous blood, the air having found its way into an open branch of the pulmonary vein, and thence into the left side of the heart. The air which was found in the right side of the heart and veins, according to his view, had passed through the systemic capillaries. As the direct cause of death, anæmia of the brain is mentioned.

*Remarks.* It seems to me that several reasons might be mentioned which would throw doubt on the correctness of the assertion that in this case the immediate cause of death was owing to entrance of air into the pulmonary vein. 1. The time which had elapsed from the commencement of the attack until death took place, was not sufficient to produce such an extensive distribution of air, unless it could be proved that the heart's action continued after respiration had ceased. 2. The existence of an open vessel in any of the cavities was not proven at the examination after death. 3. The body appears to have been affected by a certain amount of putrefaction, which may have been sufficient in degree to give rise to the evolution of gases, and the putrefactive changes may have been limited to, or were, at least, farthest advanced in the blood, which would explain the absence of gas in any other part of the body except within the blood-vessels. 4. Syncope is a frequent cause of sudden death in greatly debilitated patients when the heart is called upon suddenly to perform an increased amount of labor, as when the patient suddenly assumes the erect position.

*Superior Longitudinal Sinus.* Volkmann's case. (*Verhandlungen d. Deutschen Gesellschaft f. Chirurgie*, Vol. VI., p. 32.) The only fatal case of admission of air into the sinuses of the dura mater is reported by Genzmer. The patient was a female, 63 years of age, who was affected with a perforating sarcoma of the dura mater. The tumor was noticed about two years before the operation, and was located in the region of the posterior extremity of the sagittal suture, and for a long time gave rise to no inconvenience. For the last six months it caused intense headache. On one occasion, a physician, believing it was an atheroma, attempted its removal, but, as the first incision gave rise to copious hemorrhage, he desisted from any fur-

ther attempts, and the wound healed kindly. When the patient was admitted under Volkmann's care into the Clinic at Halle, the tumor presented a lobulated appearance, being composed of three parts, each about the size of a plum, and was located over the posterior extremity of the sagittal suture. On touch, the tumor was soft and elastic, and imparted to the finger distinct pulsations. Gradual compression reduced its size one-half; when the pressure was discontinued it resumed its former dimensions. On auscultation a blowing sound was heard synchronous with the radial pulse. By pressing the end of the index finger deeply between the lobes of the tumor a bony defect in the skull was readily detected. The conclusion was reached that the tumor had sprung from the dura mater, and had perforated the skull by the prolonged pressure, causing interstitial absorption of the cranial vault. During the patient's stay in the hospital the tumor increased very rapidly in size. As no brain symptoms were present, it was assumed that the substance of the brain was intact. In view of the speedily fatal issue which, of necessity, would take place without operative interference, Volkmann decided to remove the tumor. The operation was done April 2, 1875. Under strict antiseptic precautions the tumor was exposed by a crucial incision, and the flaps reflected with the periosteum to the margins of the opening in the skull. The aperture in the bone measured  $5\frac{1}{2}$  by  $4\frac{1}{2}$  cm. in diameter. With a Luer's cutting forceps the opening was enlarged to 7 by 8 cm. The tumor, when exposed, was nearly as large as a fist, and firmly adherent to the dura mater. The dura mater was carefully divided around the margins of the tumor, which had now been liberated from all its attachments except the falx cerebri. It was now drawn forward through the opening in the skull and the falx cerebri divided with scissors from before backwards. This step of the operation was attended by alarming hemorrhage. As the blood was being sponged away to expose momentarily the field of operation, a peculiar and characteristic lapping sound was heard, which indicated to all present, that air had entered the longitudinal sinus. At the same time, the assistant, who was giving chloform, remarked: "She is dying." The wound was immediately compressed with a large carbolized



sponge. The patient was in collapse, her breathing was interrupted and stertorous. After a short pause it was determined to complete the operation, but as soon as the tumor was again drawn forward, and its attachment at the junction of the longitudinal with the transverse sinuses was divided, air again entered, accompanied by the same characteristic sound. The tumor was separated rapidly from its remaining attachments, and a Lister dressing was applied in such a manner as to make, at the same time, a requisite amount of compression for the double purpose of arresting hemorrhage and preventing further ingress of air. At this time the patient was pulseless, pupils dilated, extremities cold and blue. Autotransfusion by constricting the arms and legs with elastic bandages had the effect of momentarily stimulating the heart, but respiration became more irregular and interrupted, and after a few more brief moments the patient died. At the post-mortem examination, which was held on the following day, the right side of the heart was opened under water, air-bubbles escaped, showing conclusively that air had made its entrance through the longitudinal sinus. The left side of the heart contained no air. Air was also found in the pulmonary artery and the subpleural vessels. The left side of the brain had suffered more from compression by the tumor than the right. The defect in the dura mater corresponded to the opening in the skull. An additional source of hemorrhage was detected at the posterior margin of the defect in the cranium where the opening of a vein in the substance of the bone 5 mm. in diameter could be seen. Under the microscope the tumor showed small spindle-shaped cells, with a very vascular intercellular substance.

*Remarks.* In this case, all circumstances favored the entrance of air into the wounded sinus. The sudden and severe loss of blood from such a large reservoir as the longitudinal sinus rendered the vessel empty, thus creating the most essential element in the causation of air aspiration. The position of the patient during the operation, undoubtedly was such that the force of gravitation assisted materially in the formation of a vacuum. The walls of the sinus being rigid and attached to the surrounding structures prevented collapse of the vessel and held the wound patulous. That death was owing to the

introduction of air is sufficiently proven by the symptoms during life and the evidences derived from the post-mortem examination.

*Veins of Diplöe.* Franck (*Sur la transmission de l'aspiration thoracique jusqu'aux canaux veineux des os du crâne, etc.* *Gazette Méd.*, 1881, No. 25) asserts that he has repeatedly seen aspiration of air into the veins of the diplöe after trephining. He claims that the air reaches the heart through the medium of the vertebral veins which, from their protected position, are more favorably located for this purpose. By experiments he proved that ligation of the jugular veins does not prevent the aspiration of air through the veins of the diplöe, while, on the other hand, this accident cannot happen when the vertebral veins are compressed. As the veins of the diplöe, in some instances, are unusually large, and their walls firmly attached to the unyielding bone tissue, they constitute channels which cannot contract in the event they are injured, consequently we should, *a priori*, expect that aspiration of air will take place under the same circumstances as in the case of the sinuses of the dura mater, and, in all extensive injuries of the cranial bones the same caution should be exercised to guard against this accident. In troublesome hemorrhage from venous sinuses in bone the bleeding is promptly and safely arrested by implantation of an aseptic sponge which can be left *in situ* as it will be removed by the granulation tissue during cicatrization. In such instances the sponge is peculiarly well adapted, as the lumen of the vessel is surrounded by unyielding bony walls which will support any amount of pressure on part of the aseptic tampon.

[To be continued.]

# SURGICAL OBSERVATIONS IN THE TREATMENT OF THE DISEASES AND ACCIDENTS OF THE LIVER.<sup>1</sup>

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UNTIL within a recent period the liver and its annexa have appealed in vain for the help accorded to its neighbors in the abdominal cavity. Such aid has been restricted to the treatment of abscess and hydatids. The frequent occurrence of suppurative hepatitis in the tropics afforded opportunities for clinical study that led to the early recognition of indications for the prompt and early evacuation of cavities resulting from that disease. Thirty years ago, Budd, in his monograph "On Diseases of the Liver," expressed himself as follows: "From what I have seen and read of hepatic abscess, it seems to me that the proportion of recoveries has been just as great, or even greater, when the abscess has opened into the lung or the bowel, as when it has made its way through the side, and I can only explain the circumstance by the fact that, when an abscess has pointed at the side, it has seldom been allowed to open of itself. When the abscess is large, and has existed long, its walls are thick and unyielding, and it has, in consequence, still less disposition to close up. When an abscess of this kind opens of itself, either outwardly or into the intestine or lung, matter continues to be discharged, and the patient generally dies worn out by the protracted suppuration. When the abscess is opened by the knife, the same thing, of course, happens, and the patient dies the earlier for our meddling. In India now, it seems to be the common practice to thrust a long exploring needle into the liver, where the presence of an abscess is suspected; and now and then, perhaps, the disease

<sup>1</sup> Read before the New York Surgical Society, January 13, 1885.

may be cured in this way. A single abscess may be opened when it is of moderate size, and before its walls are too thick and firm to close together, and the cavity may be thus obliterated. But there are many objections to the practice that to me seem quite decisive against it. First, there is the danger of hæmorrhage, and of setting up fresh inflammation by the mechanical injury thus done to the liver. This danger may, perhaps, be small for a single puncture, but, if the abscess is deep seated, it may not be hit at the first thrust. Again, from the difficulty of distinguishing the different diseases of the liver, if the operation is commonly adopted, it must often be performed where there is no abscess at all. It will readily be imagined that much mischief may be done in this way. Often, too, there is more than one abscess. This was the case in thirteen of the twenty-nine cases recorded by Annesly, and in still larger proportion in the cases collected by Andral, and Louis, and myself. We can hardly hope to reach all the abscesses, and, unless we do, we cannot cure the patient. Then there is the danger, that has been before alluded to, of letting the matter escape into the peritonæum, and setting up peritonitis, that may be speedily fatal. An occasional instance of success will, I fear, be a poor set-off against the cases in which the operation has done mischief, or failed of doing good."

Such was the doctrine enunciated by a writer that was recognized as an authority in 1852. We shall see how the improvements in modern treatment have swept away most of these objections, although at the same time we are bound to give due consideration to opinions based upon the study of a large number of cases. That the sudden evacuation of such abscesses is apt to be followed by considerable hæmorrhage from the granulations that line their interior, we are well aware, but that it is apt to be of a serious character is extremely doubtful. At all events, it is probable that the benefit derived from such evacuation will outweigh the loss of blood. The character of the tissues in which such cavities are formed is opposed to their contraction, and the surrounding structures are very likely to resent interference by extension of inflammatory processes that may perpetuate the conditions already existing, or lead to the formation of suppurative foci in the neighborhood, or even

to necrotic processes of a serious character. Most of these conditions which are referred to as complicating incision or puncture will occur when a spontaneous opening forms. It is true that such an opening is usually minute, and permits a very gradual discharge of the contents, but without antiseptic appliances it would be impossible to keep such a cavity aseptic, and such a condition would cause bad local reactions, to say nothing of the danger of general infection. Then, again, to open through the abdominal or lower thoracic wall occupies a considerable period of time, during which the abscess itself is enlarging, and the patient himself becoming more exhausted. I think that, where we find a large number of small collections of pus scattered through the liver, with one large central abscess, the histories of such cases and the post mortem investigations go far to prove that the small collections are secondary to the large one, which would be an indication for early operation, and I certainly cannot see that the existence of other collections should contra-indicate an operation on an abscess that is fluctuant and approaching the surface. Of course, I am not referring to the multiple abscesses that are found in pyæmia.

A man entered the Presbyterian Hospital on the 20th of August, 1883, with a large, hard tumor, situated in the epigastric and right hypochondriac region. It was prominent in front, and over the center was a spot, two inches and a half in diameter, that was exceedingly tender, and the seat of obscure fluctuation. His general condition was bad. On the 22d the aspirator was used, and three ounces of pus were withdrawn. On the 25th the operation was repeated, and the same amount of pus was obtained. On the 27th he was very restless, sweat profusely, and complained of severe epigastric pain. September 2d he vomited a good deal of glairy mucus. On the 5th he had diarrhœa, and the excreta were mixed with blood and pus. The diarrhœa continued, and he died on the 12th, of gradual exhaustion. At the autopsy the principal lesions were found in the liver, although there were also found evidences of chronic diffuse nephritis. The liver was found to be the seat of multiple abscesses. The lower border of the right lobe was found adherent to the abdominal parietes. At this point was a large abscess which communicated with the commencement of the duodenum by a ragged opening, which was cut off from the

abdominal sac by adhesions of the parietal and visceral peritonæum. It is probable that these smaller abscesses were secondary to the large one, and that an early operation might have prolonged the man's life.

The dread of opening the abdominal cavity in an attempt to reach an abscess of the liver for a long time deterred medical men from operating; much time was lost in studying the physical signs that indicated the formation of adhesions. Then Graves made an advance in the right direction, practicing an incision over the most prominent part of the tumor down to the peritonæum, filling it with lint, and thus diminishing resistance and inviting a spontaneous discharge. At a later period Récamier advised opening the abscess, from without inward, by the successive applications of potassa fusa, a very slow and painful process. In 1842 Murray called attention to the advantages derived from the method by puncture, insisting upon the introduction of an ordinary-sized trocar and canula, leaving the latter in position until adhesions formed between the liver and abdominal wall; and that this does occur in the large majority of cases there can be no doubt. In fact, Jameson (*Lancet*, April 29, 1871) demonstrated such to be the fact in a case in which the patient died on the 4th day after the operation, and in which the parts were found adherent around the artificial opening for a breadth of one centimetre and a half.

With improved methods of treating such conditions, we are warranted in anticipating more favorable issues in the future. In 1883 Lawson Tait reported four cases of hepatotomy, in which the existence or non-existence of adhesions was not considered. Three of these were for cases of hydatid disease, and one was for a large abscess. In all of them incisions were made through the abdominal wall, exposing the cyst, which was then opened and attached to the margins of the external opening by suture. All of the patients recovered completely. The great advance made by the author of these operations was in attacking the disease by a systematic procedure, without regard to adhesions.

Conditions of the annexa of the liver calling for surgical interference are very various, but most commonly due to stenosis and occlusion of the biliary excretory ducts. Simple dilatation of the gall-bladder is associated with obliteration of the folds

that are characteristic of its lining membrane and thinning of its walls. It may attain an enormous size, but generally maintains its natural form. It is not generally adherent to surrounding parts, and contains only more or less bile-stained mucus.

Empyema of the gall-bladder is not attended with change in form, but only in size. It may be free, or united to surrounding parts by firm fibrous adhesions; the walls have become friable and are easily lacerated. Recoveries from simple dilatation are common enough. The obstruction may cease to exist, especially if due to calculus in the common or cystic duct, and on the removal of this, the inflammatory processes in the gall-bladder speedily disappear. In other cases the disease progresses steadily, exposing the patient to the dangers of ulcerative perforation or rupture. Especially is this apt to happen in empyema due to gall-stones. In some cases it has been noticed that very marked changes occur in the size of the distended gall-bladder, due to calculi acting as ball-valves.

A patient with a well-marked and interesting case of this kind entered the Presbyterian Hospital June 28, 1880. She was a widow, forty-five years old, who first began to suffer from pain in her right hypochondrium four years before admission. Eighteen months before she began to have unusually severe paroxysms of pain that were preceded by chills and fever, and these attacks were repeated with intervals of eight or nine days. On admission, she was found to be deeply jaundiced, had white stools, and high-colored urine; complained of pain, pruritus, and occasional vomiting. There was marked tenderness over the epigastrium, the liver was enlarged, measuring six inches in vertical line; its free border could be felt free from any irregularities. The day after admission she had one of her attacks, beginning with a chill, followed by exaltation of temperature. She suffered from intense pain, and the gall-bladder could be felt distinctly below the free border of the ribs. After this the paroxysms occurred about once a week. It was observed that the gall-bladder became more and more dilated before and during the attacks, with increase of the jaundice to a bronze color, and that, on the subsidence of the pain, the size of the gall-bladder diminished, and the jaundice became lighter in color. It was thought that the obstruction was due to a calculus in the common duct; that, when this became dilated, it permitted the calculus to recede and the contents to escape; that, when the dilated duct emptied itself, it grasped the stone and closed the duct. After lingering until September 30th, she died from profuse diarrhœa and exhaustion.

The autopsy was made thirteen hours after death. The portal system was found distended with blood. There was no fluid in the cavity of the peritonæum. The stomach and duodenum were opened *in situ*. On the inner surface of the latter was a conical prominent projection, on the apex of which was the opening of the common duct. Pressure on the gall-bladder caused an escape of bile from this orifice. A probe passed through it entered a large ampulla, which, on further examination, was found to be the dilated duct continuous with a cavity in the substance of the liver itself, and probably caused by ulceration of the walls of the duct by the pressure of a calculus which had recently escaped into the intestine. The two ducts which unite to form the main hepatic duct were each distended by a calculus as large as a good-sized marble. There were several small abscesses in either lobe, and the left lobe was larger than the right. In this case all those conditions which it would have been possible to recognize during life would have warranted an operation, and yet the pathological lesions found after death would seem to prove that such a procedure would have done no good. The abscesses were, no doubt, secondary to the ulceration in the walls of the common duct.

The operation of cholecystotomy was first proposed by Jean Louis Petit (*Memoires de l'Académie de Chirurgie*, t. 1, p. 155): afterward, and independently, by Dr. Handfield Jones. It was first performed by Dr. Bobbs, June 15, 1867, then by Dr. Marion Sims, Ransohoff, and a number of European surgeons, and it may now be fairly said to be one of the recognized operations in surgery. But, from the nature of conditions that not infrequently complicate it, it must often fail. It will frequently happen that the calculi are inaccessible, hidden in recesses and diverticula that cannot be reached, and that such circumstances will render it impossible to complete an operation justified by all the symptoms that could be made out during life. The steps of the operation will be similar to those used in gastrostomy. The careful introduction of each interrupted suture through skin, parietal and visceral peritonæum, and incision immediately following fixation, has been followed by the best results. Circumstances might present themselves that would render it advisable to open the gall-bladder before attaching it to the abdominal wall. In attaching the walls of a cavity distended to its utmost, a faulty needle, with cutting edges, might easily penetrate through all



the tunics that enter into the composition of its walls, and permit a leakage sufficient to excite peritonitis of a fatal character. If such conditions should appear to warrant incision previous to suture, it would be proper to use Keen's scoop, or to empty and disinfect the cavity through the medium of an aspirator.

Ruptures of the liver, generally fatal, are more immediately concerned in the subject of this paper. Most frequently the result of severe accidents, they are attended with marked symptoms of collapse, sometimes with local conditions that may indicate the existence of abdominal hæmorrhage. More frequently the patient dies speedily, and in the majority of the cases that I have seen the lesions have been only suspected during life; but I think that in the future the diagnosis will be made during life by explorative operations.

Five years ago I saw a youth who had been thrown from a wagon a month before my visit. He came in violent collision with a lamp-post, but soon recovered from shock. His physician informed me that for several days there were no symptoms of serious mischief, but that, after the first week, there slowly developed tenderness and swelling in the right hypochondriac region. I found him with a much distended abdomen, dull on the right side and resonant on the left. The dullness on the right was continuous with the usual area of liver dullness and reached downward nearly to the iliac fossa. The swelling was fluctuant, and had been emptied more or less completely on several occasions by the physician in attendance, and on the day of my visit a large amount of apparently pure bile was removed by the aspirator. There were no symptoms of obstruction present, and it was the opinion of the physician that rupture had occurred, and that the bond of union had yielded slowly to the pressure of the ducts, forming an adventitious cyst. Subsequently, a large opening formed, which drained off large quantities of bile, and he succumbed at last to a drain upon his system. Unfortunately, the case is not complete. I saw him only once, and efforts to obtain an autopsy were of no avail.

The following case<sup>1</sup> of injury occurred in my service, and is of considerable interest in several respects;

Charles McHugh, twenty-nine years old, native of Ireland, was admitted to the Presbyterian Hospital, in the city of New York, July 3, 1883, service of Dr. Charles K. Briddon, with the following history:

<sup>1</sup> Reported by Dr. Charles G. Wagner, House Surgeon.

While under the influence of liquor, and attempting to work at his trade as a bricklayer, he lost his footing and fell from the third story to the cellar bottom, landing on a pile of bricks. When he was admitted to the hospital, he was in a condition of profound collapse, which lasted for some considerable time. As soon as he was able to respond to interrogations, it was ascertained that he was suffering from severe abdominal pain, concentrated principally in the right hypochondriac and lumbar regions, and in the right scapulo-humeral articulation. His condition was such at this time as to preclude any very exact physical exploration, but no crepitus could be made out in the neighborhood of the shoulder. His temperature was about normal, his pulse frequent and thready.

On the following day the signs of shock were still present. It was noticed that all the urine that he passed was bloody, the abdominal muscles were tense, and there was a manifest swelling between the cartilages of the ribs and the right iliac fossa, which region was exquisitely tender to the touch. Temperature  $103^{\circ}$ , pulse 120.

A week elapsed before the symptoms of shock had entirely passed, and during this time there was a gradual abatement of the local signs, the pain diminished, the abdomen became less tense, and there was an obscure fluctuation in the hypochondriac and anterior lumbar region. Urine still continued bloody.

*July 25.*—Three weeks after the injury was received, the blood had entirely disappeared from the urine. Patient complained of much difficulty in breathing and pain in the side; there was some diffused abdominal tenderness, but it was still principally concentrated in the right side. There was absolute dullness from the nipple line to a level with the anterior superior spinous process of the ilium, and below the free border of the ribs fluctuation was manifest. Believing that the collection of fluid originated in the kidney, and that it was confined by a capsule formed out of connective tissue, it was determined to explore it with a needle. The puncture was made a little below the free border of the eighth rib, and, on connecting with Dieulafoy's apparatus, sixty-nine ounces of fluid were removed. It had all the characteristics of pure bile. The chemical analysis and the microscopic appearances confirmed that opinion.

Patient was very much relieved by the operation. The difficulty of breathing and pain almost entirely disappeared, and his temperature dropped to nearly the normal. This condition was maintained until the evening of the following day, when the patient had a chill, which was followed by elevation of the temperature to  $103^{\circ}$ , pulse 136, respiration 36. In this short time the sac had refilled, the physical signs

were as before, and he complained much of the pain and difficulty of breathing; his face was somewhat flushed, and there was a perceptibly yellowish tinge of the sclerotics. On the 27th, his symptoms were of such an urgent character as seemed to demand either aspiration or free incision, and the latter was determined upon. His condition did not appear to warrant the use of an anæsthetic. An incision one inch and a half long was made below the free borders of the eighth and ninth ribs, not being certain whether the fluid was contained within the dilated gall-bladder or an adventitious cyst. The dissection was carried carefully through the abdominal muscles until the cavity was reached. The peritonæum was not opened. A large gush of bile escaped, and seventy-five ounces were collected. As soon as the opening was made, the index-finger was introduced, and, wherever it could reach so as to come in contact with the walls, the cavity appeared to be lined with a perfectly smooth surface. No blood and no coagula escaped. Of course, the finger was too short to map out the confines of the space. After it was emptied, another attempt was made to explore with the finger, but it was found that the internal aperture was blocked by a solid mass that moved upward and downward with the movements of respiration. On passing the finger downward, it could be passed under this mass, which was made out to be the liver, which probably had been pushed up by the accumulation, and which had gravitated downward on its removal. A large drainage-tube was fixed in position, and a dressing of carbolized gauze.

The operation gave prompt relief, and it was, of course, more permanent in character than the aspiration. A free discharge of bile occurred, necessitating frequent changes in dressing. With occasional fluctuations as regards quantity, the discharge continued for several weeks. For the first few weeks it was apparently mere bile unmixed with other secretions. During this time the bowels were constipated, and the dejections were clay-colored, and on one or two occasions there was a slightly perceptible yellowish hue of the skin, but at no time amounting to jaundice, and there was not any marked emaciation.

On the 22d of August (during the absence of Dr. Briddon from the city) the patient accidentally removed the drainage-tube. A new one was introduced, and simple dressings to the opening, which only gave exit to a moderate amount of pus. On removing the dressing on the following day, the tube was missing, and could not be found. It was of the ordinary soft rubber, a quarter of an inch in diameter, and eight inches long. It was supposed to have disappeared into the cavity of the wound, and it is possible that it might have been drawn into it by the suction movement of inspiration. At all events, it could not be

found. After ineffectual efforts to recover it, the patient's temperature rose to  $105^{\circ}$ , where it remained for a few days and fell again to the normal.

On the return of Dr. Briddon, September 2d, a tupelo tent was introduced for the purpose of dilating the sinus so as to permit of a more thorough exploration of the part. The patient took this out without permission, stating that he could not tolerate the pain caused by its presence. He had another rise of temperature. In fact, it appeared that any interference with the interior of the cavity was resented by a ferbrile movement. The treatment at this time consisted in daily irrigations, variously medicated—at one time with boric acid, and subsequently with tincture of iodine.

About the middle of November, four months after the injury was received, patient began to have severe attacks of coughing, and there were some physical signs of a suspicious character to the right of the right border of the middle of the sternum. These signs were thought to indicate the existence of a cavity. The attacks of coughing were always brought on during the process of irrigation, and on several occasions when iodine was used the patient said that he could taste it in his mouth. It appeared probable that adhesions had formed between the lung and diaphragm on the one side, and that perforation of the latter had permitted the contents of the sinus to reach the lung itself. It was considered extremely doubtful whether any drainage-tube had receded into the wound. It was, however, deemed proper to endeavor to make a freer exit for the discharge of anything that might be found above the diaphragm. There was no collection of fluid in the cavity of the pleura at any time.

November 27 the patient was etherized, and the superficial portion of the sinus was gradually dilated, first with sounds, and then with the finger. It appeared to pass directly upward. Almost in contact with the inner surface of the ribs, at a distance of about three inches from the surface, the finger engaged in a narrow, constricted portion, and, on forcibly dilating this, passed into a larger cavity, apparently above the diaphragm. It was noticed at this time that there was some bloody froth in the mouth of the patient, and it was regarded as evidence that the opinion as to a probable communication between the original cavity and the tubular structure of the lung was correct. A very faithful search was made for the missing drainage-tube, with every conceivable form of forceps, and with wire snares passed through cut-off catheters, but without result, and it was considered scarcely possible that it could have escaped being found. Two large drainage-tubes were introduced side by side, and the wound was dressed as before. This operation

was followed by less reaction than was expected, and after a few days there was a manifest improvement in his condition. His cough entirely ceased, the discharge diminished in quantity; he gained flesh, and in about six weeks, though the discharge still continued, he asked and obtained his discharge.

He was again seen about the middle of May, 1884. He was in very good general health, and had been working at his trade without inconvenience, still wearing the tube, through which there was a little discharge.

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## REPORT OF CASES OF SURGICAL AFFECTIONS OF JOINTS TREATED WITH LISTERIAN ANTISEPTIC PRECAUTIONS.

By HORATIO P. SYMONDS, F.R.C.S., ED.

OF OXFORD.

SURGEON TO THE RADCLIFFE INFIRMARY.

1. *Popliteal Abscess Communicating with the Knee-Joint.* 2. *Wound of Knee-Joint; Suppuration; Free Drainage.* 3. *Osteotomy for Badly United Fracture of Tibia and Fibula (Pott's Fracture).* 4 and 5. *Two Cases of Fractured Patella, Treated by Suture; Removal of Loose Fragment from Joint in one of the Cases.*

The following form a series of cases recently under my charge in the Radcliffe Infirmary, Oxford. The first is one of suppuration in the knee-joint, bursting into the popliteal space, in which position it was opened and drained by counter openings through the joint.

The second case is also of suppuration in the joint, caused by a wound of the synovial membrane. It was evidently septic when the joint was opened, and instead of syringing the cavity with the usual 1-20 solution of phenol, I used a solution

of corrosive sublimate. From this and similar cases I am inclined to think it a more effectual agent than the former.

The third case, osteotomy for badly united fracture of tibia and fibula, where a portion of the inner malleolus was excised, and a very marked deformity thereby removed, a useful limb and moveable joint resulting.

The fourth and fifth were cases of fracture of the patella, in which the fragments were united by wire sutures, the result being perfect movement of the joints and firm bony union of the bones.

Case 1. *Popliteal abscess communicating with the knee-joint.* A man, aged 43, by trade a navvy, was admitted into the infirmary on Sept. 10, 1884. The history was one apparently of chronic synovitis of the left knee of about a year's duration. He had been in a hospital for four months, and was relieved so far as to be able to get about and do his work for a few weeks. The joint then again became swollen and painful, and he entered another hospital. When admitted to the Radcliffe Infirmary there was a considerable amount of fluid in the joint, and also a separate collection (as it seemed) in the popliteal space, the skin over which was cedematous and inflamed. The urine contained a trace of albumen. The temperature was high.

On the third day after admission an incision was made with antiseptic precautions into the abscess behind, and as it was found to communicate with the joint, two other incisions were made on each side of the patella and a large drainage-tube passed through, another tube being inserted into the first opening. No dead bone was felt nor any erosion of the cartilages. The temperature on the evening of the operation was  $101.8^{\circ}$ . The knee was dressed on the following day. Morning temperature,  $100.5^{\circ}$ ; evening  $103^{\circ}$ . On the second day after operation morning temperature normal; evening temperature,  $102.4^{\circ}$ . The dressings were changed on the 4th, 5th and 6th days, and after that at intervals of two or three days. On the 4th day morning temperature was  $97.8^{\circ}$ ; evening,  $98^{\circ}$ . He had but little pain, and there was only a moderate amount of quite sweet discharge. One of the drainage-tubes was removed ten days after the operation, when the discharge was much less. By Oct. 17 (five weeks after operation) the wounds were quite superficial, and there was a little movement in the joint. The patient left the hospital in December, wearing a Thomas splint. He has now free movement of the joint, almost to a right angle, but not further than this, owing to thickening of the tissues, the result of the long continued inflammation.

Case 2. *Wound of knee-joint ; suppuration ; free drainage.* A boy, aged 8, on January 13 received an injury in his knee by a rusty nail running into the thigh, just above the patella. Two days later the joint became swollen and painful. On admission a fluctuating swelling was found above the patella and some fluid in the joint. The tissues round the joint were also swollen.

On Jan. 20 an incision was made into the abscess and a quantity of pus let out. It did not appear as if there was any communication with the joint. The boy suffered considerable pain still in the knee, and the temperature kept higher, being  $102.5^{\circ}$  and  $102^{\circ}$  at night.

On Jan. 17 an abscess appeared about the middle of the outer side of the thigh. This was opened, and was found to be the upper extremity of the synovial pouch of the knee; a counter opening being made at the inner side of the joint, a large drainage-tube was passed through. The cavity of the abscess was thoroughly irrigated with two gallons of a solution of corrosive sublimate (1-1000). The result of this operation was at first to lower the temperature to  $99^{\circ}$  at night. On the next day it was  $99.6^{\circ}$  in morning,  $100.5^{\circ}$  in evening. The knee was dressed the same night and on the next day. There was considerable discharge. The temperature kept high, being usually  $99^{\circ}$  in the morning and  $101.5^{\circ}$  in evening till Feb. 3, then it remained  $100^{\circ}$  in the evening till Feb. 10, after which it was normal. The knee was dressed every third or fourth day. There is a very fair amount of movement now, three months after the operation.

Case 3. *Operation for badly united fracture of tibia and fibula.* (Potts). Patient a man, aged 42, on September 11, 1884, he fractured both bones of the leg through the internal malleolus. The foot was so much displaced outwards that it was necessary to divide the tendo-Achilles to reduce it. The man had delirium tremens afterwards, and owing to this and other causes a considerable amount of deformity was left. The foot turned outwards, and the sharp point of the tibia was very close to the skin on the inside. On October 10 a vertical incision was made over the internal malleolus, and a wedge-shaped piece of bone removed, subperiosteally, the lower part of which was the articular surface of the tibia, the ankle joint being thus opened. The small lower fragment of the malleolus was covered by granulations and was left *in situ*. The fibula was refractured.

The temperature after the operation never rose above  $99^{\circ}$ . By November 18 the wound was healed. There was a small amount of movement in the ankle joint, which became by degrees more free. In January the movement was good. At the end of three weeks the joint

was put into plaster of Paris, and after another three weeks passive movement of the joint was commenced.

Case 4. *Operation for fractured patella.* The patient was a man, aged 24, admitted April 1, 1884, having fallen on the right knee, causing a comminuted fracture of the patella. When the swelling in the joint had subsided, the bone was found to be broken into several pieces, the upper one of which was projecting vertically into the joint and could not be replaced. Under these circumstances an operation was thought advisable. This was performed a fortnight after admission. When the joint was opened the patella was found to be broken into seven pieces, one of which, chipped off from its posterior surface, was lying free in the cavity. This and some of the smaller pieces were removed, leaving four larger fragments, of which the upper and lower on the same side were wired together, no transverse wire being needed to keep them in place. After the operation the joint remained distended for several days, but the discharge was very moderate. At the end of a week all the drainage-tubes but one were removed. There was no purulent discharge. All the stitches were removed five days later, and the remaining tube taken out at the end of the fortnight. On May 5 a Thomas' splint was applied and the patient was able to get about on a patten. Early in June some movement was noted in the joint, and the splint was left off. When he left the infirmary the knee could be flexed about two-thirds of its normal distance, then coming suddenly to a stop. He could walk well.

Case 5. *Operation for fractured patella.* A man, aged 45, three weeks before admission slipped and injured the knee, though the fracture was not at first detected. A transverse fracture of the patella was found, with an interval of an inch and a half. There was only a moderate amount of effusion. On July 18, 1884, a longitudinal incision was made over the front of the knee, and the fragments wired together by two strong silver wires. At first a single median wire was put in, but the patient suddenly flexed his leg when the operation was just over, causing the wire to tear out, necessitating a repetition of the whole process. Drainage tubes were introduced on each side into the joint; a wooden back splint was used. One of the tubes was taken out on 25th, the other a few days later. In three weeks the wounds were healed, and by the end of August there was a little movement in the joint. Before he went out the patient was able to walk and the movement was fairly good.

In both these cases the wire was left in the bone.



CASE OF COMPOUND DEPRESSED FRACTURE OF  
THE SKULL WITH WOUND OF THE LONGITU-  
DINAL SINUS; TREPHINING; ALSO FRAC-  
TURE OF THE SPINOUS PROCESS OF  
THE NINTH DORSAL VERTEBRA;  
RECOVERY; NOTE ON THE  
CONSTRUCTION OF THE  
TREPHINE.

By WM. BARTON HOPKINS, M.D.

OF PHILADELPHIA.

SURGEON TO THE EPISCOPAL HOSPITAL AND TO THE OUT DEPARTMENT OF THE  
PENNSYLVANIA HOSPITAL.

WILLIAM C., 32 years of age, of temperate habits, a brakeman by occupation, was admitted into the surgical ward of the Episcopal Hospital, October 19, 1884. Three hours before his admission, while putting down brakes from the roof of a freight car, moving at the rate of thirty-five miles an hour, the chain below parted, and, as his whole support depended upon a stick which he had thrust through the brake wheel in order to get additional purchase, he was hurled to the ground. When brought to the hospital he was almost unconscious, though resisted and became restless if handled or teased. His face was pale and his pulse feeble. The pupils were contracted equally and moderately. Respiration was noisy and slow, but not stertorous. There was no paralysis nor bleeding from the ears, nose or mouth. In addition to the head injury, presently to be described, there was discovered, while making a careful examination of his whole body for other injuries, a fracture of the spinous process of the ninth dorsal vertebra. On introducing the finger into a large wound of the scalp an extensive area of depressed bone could be felt over the right parietal region.

A small quantity of ether was given and the whole extent of fracture clearly exposed by dissecting up a large flap, including the tissues down to the bone, which was turned down over the temple and pinned in position. The exact location of the fracture has been clearly ex-

hibited in the accompanying illustration by exaggerating the size of the flap. An irregular triangle of depressed bone, about  $2\frac{1}{2}$  inches in its greatest length, was found to occupy principally the central portion of the right parietal bone. Its base was depressed the thickness of the skull, and was thrust far beneath the sound bone at the lower portion of the wound; while above, its apex extended to the parietal bone on the opposite side. Although much comminuted the fracture consisted chiefly of three fragments. Much care and diligence was required to

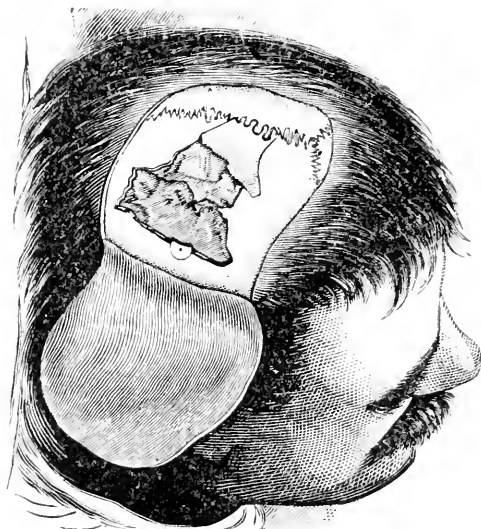


FIG. 1. EXTENSIVE COMPOUND DEPRESSED FRACTURE OF SKULL.

elevate these, as they were very firmly locked into one another and nipped by the sound bone. It was necessary, however, to apply the crown of a trephine at only one point, that corresponding to the seat of greatest depression, where the fragment had been driven under the sound bone. Each fragment in turn, from below upwards, was elevated, and each, being found quite separated from its attachments beneath by clots of blood, was removed. Under and around the uppermost fragment were found the greatest evidences of hæmorrhage, and instantly it was elevated very free bleeding occurred. It was quickly lifted out, and the blood seen to escape from a circular wound in the longitudinal sinus about a sixteenth of an inch in diameter. This fragment, examined after its removal, was found to contain upon its under surface the Pacchionian depressions, and upon its upper border the

dentations of the sagittal suture, one of these latter having probably caused the wound of the sinus. The hæmorrhage, although profuse, was so thoroughly in view that it could easily be controlled temporarily simply by the weight of a finger. Several efforts were made to apply a fine ligature about the wound, but they were unsuccessful, and the patient lost much blood during each attempt. A small compress of lint, dusted with iodoform, was lightly applied to the wound in the sinus, a single intervening layer of lint being placed next the wound to prevent the entrance of iodoform into the circulation. The dura mater was otherwise uninjured, and showed apparently healthy pulsating brain matter beneath. The sharp edges of bone having been removed with gouge forceps, the wound was washed with carbolated water, loosely approximated with silver sutures and dressed with carbolized gauze dusted with iodoform.

The patient was a good deal blanched after the operation, but reacted well by evening, his temperature being  $100\frac{1}{2}^{\circ}$ . During the night and for two days following he was excessively restless, two men being required constantly at his bedside to restrain him. The urine was drawn off by the catheter for three days, after which it was voided voluntarily. On the fifth day the dressing was removed for the first time, and the wound found to be in a healthy suppurative condition, with primary union of the incised portion of the flap. After this it was dressed every other day. The compress was removed from under the scalp on the seventh day without causing recurrence of hæmorrhage. On the following day there appeared a slight erysipelatous blush upon the right cheek, which, however, drove the temperature up only to  $101^{\circ}$ , and faded within forty-eight hours. The wound filled up rapidly with granulations, and steady improvement continued until recovery was complete.

His mental condition from the first return of consciousness, at the end of two days, was characterized at first by perfect imbecility. The restlessness had disappeared, and he would lie upon his right side, staring vacantly around him. He paid no attention to what was said to him, and indeed showed no recognition of anything, except when winked at he would always wink in return. At the beginning of the second week intellection began to improve, when it was found that his memory was entirely gone. He had forgotten his age, how many children he had and their names. This symptom persisted long after his mental condition was otherwise restored, eight weeks after the accident still being unable to remember all of the stations on the railroad where he was employed. He had no headache at any time, and seldom complained even of discomfort at the seat of injury. Small pieces

of bone were several times removed, and an ulcer at the cicatrix still remained when he was discharged from the hospital. The fracture of the spinous process of the dorsal vertebra united slowly, but gave rise to no trouble.

He became an out-patient December 28, 1884.

Although the case, on account of the severity of the head injury, its favorable termination, and the somewhat unusual lesion of the spine, is worthy of record, the principal point of interest attached to the wound of the longitudinal sinus. The generally recognized fact, that if the hemorrhage proceeds from a point which is clearly exposed to view, there is no immediate danger, was here well illustrated. Its permanent arrest by means of a compress, though accomplishing the object, did not give that feeling of confidence which would have been obtained had the attempt to apply a ligature succeeded. Efforts to do this, with tenacula and forceps, were persevered in a number of times, and were not abandoned until there was risk of fatal syncope from the loss of blood which accompanied each attempt. The cause of failure depended on the tense character of the edges of the opening in the sinus, which would not yield sufficiently to permit of the puckering necessary to its closure.

The patient had apparently lost a good deal of blood before his admission; he certainly lost much during the operation; and to this cerebral depletion may properly be ascribed the very moderate character of the inflammation which followed.

#### A NOTE ON THE CONSTRUCTION OF THE TREPHINE.

*Its centre-point.* Several years ago, while substituting Dr. R. J. Lewis in the wards of the Pennsylvania Hospital, I had occasion to trephine a boy eight years of age for compound depressed fracture of the skull, and, from an incident which occurred during the operation, had reason to be strongly impressed with a fact which, although quite apparent, has not, perhaps, been sufficiently emphasized—namely, that the depth reached by the centre-point of a trephine is equivalent to the distance it projects beyond the level of the teeth, *plus the depth the teeth of the instrument are sunk before they engage.* With due allowance, as I thought, for the extreme thinness of

the skull in a subject so young, I set the centre-point of a small trephine with a projection of about  $\frac{1}{32}$  of an inch, and directly the teeth engaged withdrew it. On lifting out the button of bone it was found to have been penetrated by the centre-point. Although no damage had been done thereby to the dura mater, and the case progressed rapidly to recovery, I censured myself for the occurrence, especially as I had some time before constructed a model of an instrument designed to avoid this very risk. The modification, which is a slight one,

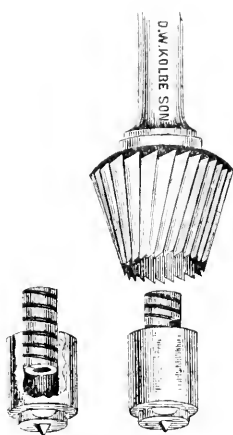


FIG. 2. MODIFIED TREPHINE CENTRE POINT.

and may be readily adapted to the ordinary instrument, has also for its object the absolute certainty of preventing penetration of the centre-point, through neglect to withdraw it at the proper time. It consists, as shown in the cut, of a cylindrical nut, armed with a minute point, which occupies the cavity of the crown and is projected therefrom by a spiral spring contained in its centre. Its action is obvious. When applied to the part, the centre-point engages, but slight pressure causes it to recede and permits the teeth to cut, until the nut has been pressed home in the cavity of the crown, when the teeth refuse to cut further until the nut is dropped out. After this the operation is proceeded with in the ordinary manner.

*Its crown.* The object, as is well known, of the conical

shape which has wisely been given to the modern instrument is to make it act like a reamer and bury no deeper than it cuts. As many are constructed, however, this may give a false sense of security. In careful hands, no cone is needed. In others, a slight cone may be worse than none. Theoretically, a trephine with a conical crown will not slip, after it has cut its way through the skull; but as even the most skillful manipulation fails to prevent all swaying to any instrument which is made to bore, the diameter of the circular orifice made in the skull by the trephine is greater than that of the crown, at the point it is cutting. The crown will, therefore, as soon as the resistance below ceases, enter until its diameter coincides with that made in the bone. Therefore it would seem advisable that the crown should be always made with a decided cone, as the slight increase given thereby to the bevel of the cut through the bone can hardly be urged as an objection.

## EDITORIAL ARTICLES.

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### TUBERCULOSIS OF GLANDS, AND THE IMPORTANCE OF EARLY OPERATIONS.

(*Ueber Drüsentuberculose und die Wichtigkeit frühzeitiger Operationen.* Dr. Carl Garrè, Deutsche Zeitschrift für Chirurgie. Bd. XIX., Hft. 6, s. 529.)

The surgical text-books state that, aside from malignant affections, lymph glands present two kinds of enlargement:

Inflammatory swelling,  
Idiopathic hyperplasia.

Diagnosis of the first is easy. As for the second, we may include among its causes tuberculosis, syphilis, and leucocythæmia. For differential diagnosis we must often depend on the presence or absence of causes in the immediate neighborhood.

The more intimate knowledge of disease we possess, the less we use such terms as idiopathic, spontaneous, rheumatic, etc. In other words, the more we study the so-called idiopathic hyperplasia of lymph glands, the less idiopathic we shall consider it. In these idiopathic enlargements, moreover, there are no sharp boundaries nor any specific differences; but when we study the whole subject, we find that they occur by far most often in scrofulous individuals. In order to make it absolutely clear that the lesion so often known as scrofulous gland enlargement frequently gives us the first inkling of a latent tuberculosis, we must fall back on Koch's discovery of the specific microbe as a means of avoiding error and being sure of our ground.

This special paper under consideration at present is particularly concerned with the results of forty cases operated upon by Prof. Kocher since 1872, which have been definitely traced, after an interval of several years. The importance of the earliest possible excision of these enlarged glands is not yet fully appreciated by the profession gen-

erally. In order to give this paper more weight in this very direction, only those cases have been considered in which the histologically tubercular nature of the lesions had been carefully ascertained by the microscope.

Of the forty, all but six were lymphomata colli; in the others, the enlargements were in the axillæ, three of these having also cervical glands involved. The cervical glands which lie along, above, and below the sterno-mastoid muscle, below the jaw, above the clavicle, and behind the mastoid process, form part of a lymph-vascular region which has its fine beginnings in the skull, the face, and the neck. So far as we at present know, it is especially from the mucous membranes and the skin that the pathogenic influences come which cause these enlargements; particularly when the epithelial covering is broken. At least this holds good for acute adenitis, and there is no reason why it should not for those chronic enlargements which are the subject of this paper. That in the tubercle bacilli we find our *materia peccans* is an unavoidable conclusion from the painstaking researches of Schuchert and Krause,<sup>1</sup> who have always found them in these cases. Very often we see a tuberculous process take place after a tissue injury or an external wound, after which the glands become infected. Formerly it was held that this evidenced a "scrofulous disposition" on the part of the patient; that the tissues did not react well after injury, and that the soil was abnormal, not the irritation.

Hueter sought to make clear the encroachments of "scrofula" by an anatomical explanation. He believed in a greater width of lymph passages, by which means invasion of tissues was made easier. On the other hand, very recently, Formad has been claiming an abnormal narrowness of the same channels in "scrofulous" patients, and regards this as essential to the proper deposition and growth of bacilli. All of which shows that the bacilli, and not the passages themselves are to blame.

It is every day becoming more certain that tuberculosis is an infectious disease, whose hereditary features are not to be disclaimed or overlooked, and in many respects not so very dissimilar from syphilis.

<sup>1</sup> *Fortschritte der Medicin.* Mai, 1883.



After many others had failed, Strauss and Chamberland succeeded, in 1883, in proving experimentally that the micro-organisms of splenic fever and of Pasteur's septicæmia could pass the placenta and enter into the fetal circulation. Why may not this also be true of the tubercle bacilli, and they be enabled thus to effect hereditary transmission of the disease? Thus, too, it may happen that through the inflammatory influences to which we are all daily exposed, in an individual with what may be termed latent tuberculosis, a local lesion may be originated. By the inflammatory process the resistance of the tissues is manifestly weakened, and the bacilli find their most favorable environment in the midst of the young cells in the inflamed tissues. Healthy persons and those of proper hygienic habits have—thanks to the resistance of their tissues—the power of eliminating or antidoting the infection.

With regard to the special etiology of the cases under consideration, particular attention was paid to the examination of the mucous membrane of the mouth, pharynx, nose, ears and larynx, upon whose relatively extensive surface lesions and small tuberculous ulcers serve as the points of infection of the glands. However, when these are of long standing, they are not always easily made out; they may be inaccessible and invisible, or may have healed.

In twenty cases it was possible to learn accurately the time at which, and the source from which infection took place:

In 5	the source was	rhinitis.
In 5	“ “ “	periodontitis.
In 2	“ “ “	otitis.
In 2	“ “ “	conjunctivitis and blepharitis.
In 5	“ “ “	eczema of face or ear.
In 1	“ “ “	dacryocystitis.

Of twelve other cases the original cause was:

In 2 periodontitis.	In 1 otitis and rhinitis.
In 4 angina tonsillaris.	In 1 suppuration after vaccination.
In 2 eczema of face and ear.	In 1 metatarsal ostitis.
In 1 keratitis.	

The bronchial mucous membrane being, on account of its great extent, the most common point of infection, the bronchial glands are

those most commonly involved; but next often come those of the neck, which are more frequently enlarged than all those of the axilla, groin, and elsewhere, put together. In this place, let it be noted that we not infrequently meet with a progressive infection of a lymph-vascular region in a direction contrary to that of the lymph stream. As an example, take one of the above cases where, after mastoid inflammation, the axillary glands first enlarged, then the supra-clavicular, and finally those in the immediate vicinity of the process.

The forty cases alluded to, studied in relation to age, heredity, sex, etc., give results in no wise differing from the general average.

*Treatment.*—The fact that caseation of the glands often leads to dissemination of products, *i. e.*, general tuberculosis, should lead to a most early and energetic local treatment. It will not do to be satisfied with opening suppurating glands, nor even with provoking them to suppurate by Korb's method of parenchymatous iodine injections and massage. It was no small service which Hueter rendered when he recommended the early total extirpation of these tumors as essential in warding off general infection. Koch's discovery and the consequently clearer insight into the etiology of tuberculosis in no wise diminishes the importance of this procedure; but, on the contrary, redoubles it and places it upon even more rational ground.

As a result of the presence of bacilli in the adenoid tissue, it often happens that these glands caseify. This caseous mass is often the site of acute or subacute suppurative processes, whose cause is the irritation caused by the presence of the more or less necrotic elements that have been killed during the tubercular local infection. When this supuration is once started, it is not difficult for the infectious material to escape from its glandular bounds and be taken up by some neighboring lymph vessel. This may lead to infection of some neighboring glands or distant organs; or, as Weigert has shown, by perforation of such an abscess or its infectious products into a vein, and by a subsequent embolic process, an acute miliary tuberculosis may rapidly terminate the patient's life.

Therefore, we should do more than simply recommend early incision of such abscesses—we should reconcile our patients to the earliest possible extirpation of such glandular tumors; for only by this radical

measure can we save our patients from impending danger. And in order that they may not be deprived of a single possible benefit, general hygienic and dietetic treatment, as well as local, should not be overlooked.

Such operations may be of the simplest possible nature, or, on account of multiplicity of tumors, deep adhesions and peculiarity of position, they may require even two or three hours in the hands of a practiced operator. One long incision may be made along the sternomastoid, or, as Kocher prefers, several smaller ones, as called for.

*Final Results.*—Of the forty cases on which Garrè bases his paper, twenty-one have shown no tendency to return, nor new glandular enlargements anywhere. Ten cases showed a tendency to recedive, the new glandular tumors varying in size from that of a nut to that of an egg. In two cases details are wanting; in four subsequent trouble with the teeth was reported, and in one an eczema of the face, which probably lead in their cases to an apparent recedive; though in each of these there was reason to believe that the lungs were at fault. Two others died of phthisis a few months after operation. Phthisis was hereditary in the families of each, and both probably had incipient trouble at time of operation.

ROSWELL PARK.

## INDEX OF SURGICAL PROGRESS.

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### Chest and Abdomen.

I. EXCISION OF A FIBRO-SARCOMA GROWING FROM THE MUSCLES OF THE ABDOMINAL WALL AND OF A LARGE PIECE OF PARIETAL PERITONEUM. PORRO. The tumour lay beneath the superficial fascia, but could not be got away without taking with it some peritoneum, as it extended through the muscles. There was great pain after the operation and subcutaneous emphysema, but the patient was able to get up at the end of the third week.—*Rev. de Chirurgie.* 1884. Nov.

II. EXCISION OF HALF OF THE ABDOMINAL WALL, WITH PERITONEUM. SCLIFOVSKI. The operation was undertaken upon two occasions, in order to excise a sarcoma. In both cases a success was achieved. S. performed experiments on animals, to ascertain whether the peritoneum was renewed and whether adhesions were formed between the wall of the abdomen and its contents. In spite of antiseptics, most of the animals—dogs—did not survive the operation even for a week. Skin and subcutaneous tissues were not removed, in two experiments; adhesions formed between the skin flaps and the great omentum, but did not involve the intestines. This only occurred in cases where the omentum did not reach sufficiently low to shut off the intestines from the flaps. The tendency to ventral hernia was restrained by carefully adjusted bandages.

The author points out: 1. That the operation does not imminently imperil life. 2. That there are no distressing after effects. 3. That the risk of recurrence is much less than after simple enucleation.—*Rev. de Chirurgie.* 1884. Nov.

A. F. STREET (Westgate).

III. CASE OF EXTIRPATION OF THE SPLEEN FOR LEUCÆMIA. By J. BIZIEL (Culm). Encouraged by the favorable result achieved by Franzolini in a similar case, where complete cure was effected, Prof. Rydygier, of Culm, extirpated the spleen in a female, 31 years of age, suffering from leucæmia, with splenic tumor. The pedicle was secured with elastic ligatures, which proved insufficient, so that silk ligatures had to be added. The lig. gastro-lienale and lig. phrenico-lienale were each separately ligatured. To prevent the ligature from slipping off, a small portion of the spleen itself was left adhering to the pedicle. Death ensued from hæmorrhage from the abdominal wound.—*Deutsche Zeitsch. f. Chirurg.* Bd. XXI. Hft. 5 & 6. 1885. March 9.

W. VAN ARSDALE (New York).

IV. ABSCESS OF THE LIVER. By E. G. JANEWAY, M.D. (New York). 1. Abscesses of the liver can practically be divided into those affecting the left lobe, or the lower part of the right lobe, so that the abscess, when formed, produces an elastic or fluctuating tumor below the free borders of the ribs, and of those situated in the upper or posterior portion of the right lobe. The reason for this division is that abscesses in the two former situations are easy of access, of diagnosis, and of operative interference. The abscess in the last mentioned situation is the one which more often gives rise to difficulty in diagnosis, or, if diagnosed, to doubt as to the best and safest methods of interference.

2. There are several methods by which the existence or non-existence of adhesions between the liver and abdominal wall can be made out. The presence of hepatic friction, audible or tactile, shows the absence of adhesions, but the probability that they will soon be formed. If, on palpation, the edge of the liver remains fixed, and does not descend with respiration, adhesions have in all probability taken place. Again, a long needle—that of a hypodermic syringe or aspirator—introduced into the liver, will, if the outer end is left projecting some distance, move upward as the liver descends, and downward as the the liver ascends, if no adhesions exist. But, if these have formed, then the needle does not move.

3. The difficulties which arise in the diagnosis of liver abscess may in many cases be surmounted by a careful survey of the history, of the condition of the liver, and by exclusion of the existence of sufficient disease in other organs to account for the symptoms.

The mistakes which I have seen made have been:

a. To consider a liver abscess some other disease, as malarial fever (remittent and intermittent), typhoid fever, or tuberculosis.

b. To consider an abscess of the liver some other disease of the liver, as hydatids, cancer, congestion, fatty liver, hyperplasia.

c. To consider the swollen liver an aneurism of the aorta, especially in case of abscess of the left lobe of the liver, where pulsation was communicated to it by the aorta.

d. To consider an abscess of the gall-bladder an abscess of the liver, and *vice versa*.

e. To consider a supra-hepatic abscess an abscess of the liver.

f. To consider an abscess of the liver one of the abdominal wall, and *vice versa*.

Some years since the writer had supposed that a distinction could be made between liver abscess and cancer of the liver by careful attention to the patient's temperature; but subsequent investigation has shown that, in cases of rapidly growing or disseminating cancer, a hectic type of temperature may exist.

4. As regards the ætiology of liver abscess, I believe that many of the apparently idiopathic are of traumatic origin.

5. All accessible abscesses associated with an adherent liver are best dealt with by free incision, washing out with an antiseptic fluid, the introduction of a drainage-tube, and antiseptic dressing.

6. In cases of non-adherent liver, adhesions may be produced by the use of an abdominal bandage to fix and immobilize the liver, while absolute quiet in bed is enjoined, and then aspirating the abscess, leaving the canula *in situ* for a few days, its aperture being closed to prevent ingress of air. After a few days, the canula is to be removed and reintroduced an inch and a half from the point of previous puncture, and again, as before, allowed to remain. A free incision may be made between the two places through which the canula has been inserted.

7. In many cases of large abscess seated in the posterior portion of the right lobe, aspiration is the only resource.—*New York Med. Journal*. 1885. Feb. 7.

V. CASE OF BULLET WOUND INVOLVING RIGHT LOBE OF THE LIVER—EXTRACTION—RECOVERY. By W. F. SMART, F.R.C.S.I. (Demerara). The bullet in this case was one weighing eighty grains, fired from a revolver at three yards distance. It had penetrated at the level of the sixth rib, an inch from the sternum, and had passed downwards and outwards, lodging in the right lobe of the liver, half an inch beneath the surface. The operation consisted in opening the abdomen below the costal margin, feeling the bullet embedded in the liver, incising over it and taking it away. The dressing consisted of dry iodoform and marine lint. During the progress of the case there was some pain over the liver and tympanitis, also some difficulty in micturition. Otherwise the patient made an excellent recovery, and the wound healed in a fortnight without any suppuration. The patient was a coolie.—*Med. Press and Circular*. 1885. Jan. 7.

C. W. CATHCART (Edinburgh).

VI. CONTRIBUTIONS TO INTESTINAL SURGERY. By DR. RYDYGIER (Culm). *Pylorotomy*. The author publishes three new cases of excision of the pylorus performed at his private clinic, to which he adds some valuable remarks as to the indications and operative technique of the subject.

The operations were performed for ulcer of the stomach (one case) and for cancer (two cases). Altogether the writer has operated three times successfully for ulcer and five times in all for cancer, twice successfully. Two cases of gastro-enterostomia after Wölfler's method are added, both of which recovered.

The first excision of the pylorus for cancer was performed on a man-servant, 42 years of age, who had suffered from stomach symptoms for 17 years, and in whom a small tumor could be felt in the region of the pylorus, moveable in all directions. Incision was made in the median line; the great and small omentum were severed between applied ligatures; elastic compression of the organs was then effected; an antiseptic compress placed under the pylorus; the diseased parts were then excised at the duodenum at right angles to the intestine, but at the stomach end in an oblique line running from the right and below upwards and to the left. Sutures with finest catgut were applied according to Czerny's method (double row of sutures), with an additional row of sutures through the mucous membrane, making in all 68 sutures. The abdomen was then closed with silk sutures in the usual manner, and antiseptic dressings applied. The duration of the operation was 2½ hours. The patient died on the fourth evening. The highest temperature had been 38.4°C.

The second case was that of a woman, 41 years of age; the disease had begun eighteen months before; a tumor the size of a fist could be felt and was easily moveable. The operation was performed in a similar manner, but that continuous sutures were used throughout. The patient recovered; had no rise of temperature; was dismissed on the 32nd day.

The operation for ulcer of the stomach was performed on a woman of 48 years of age who had had stomach trouble for 13 years; a small, smooth, round tumor could be felt, which was moveable and painful. The technique did not materially differ from the foregoing case. On the second day pneumonia set in with evening temperatures of 39.0°C. She was dismissed; cured after four weeks.

Glancing at the statistics already accumulated, the author points out that there is a steady increase in the percentage of recoveries in these operations (of five excisions for ulcer only one case died), and speaks in favor of the operation.

In speaking of the technique, he lays great stress on the abdominal incision being made in the middle line. The mesentery may, according to his experience, be severed *above* the arcades, or the forking of the arteries without fear of gangrene occurring, at least to a moderate extent; it should, however, be observed whether the ligatures applied induce any discoloration in the intestine. In case no elastic compression of the gut can be achieved, it suffices to pass two sutures through opposite walls of the intestine and to close it by extending them. He favors the employment of continuous sutures. For indications he refers extensively to Czerny.

*Gastro-enterostomia.* Two cases, men, 32 and 20 years old, respectively. In the first extensive adhesions prevented an excision, which had been intended.

The other patient only weighed 51 pounds, and had been once subjected to laparotomy some months previously. An ulcer of the duodenum had been found, and the contemplated excision had been given up. Both cases resulted favorably.—*Deutsch. Zeitschr. f. Chirurg.* Bd. XXI. Hft. 5 and 6. 1885. March 9.

W. VAN ARSDALE (New York).

VII. THE TREATMENT OF INTUSSUSCEPTION. By FREDERICK TREVES, F.R.C.S. In this paper, read before the Medical Society of London, the author reviews all the important points in the pathology and treatment of intussusception. He classifies the disease anatomically into four varieties: the enteric, colic, ileo-cæcal and ileo-colic; and he gives the relative frequency of these as 30, 18, 44 and 8 per cent., respectively. Clinically, he divides them into the ultra acute, the acute, the sub acute, and chronic—a classification of more practical utility.

Of the most important complications, strangulation and obstruction take a foremost part, but it is by no means necessary for these to coëxist, and they may even both be absent. He considers that strangulation is primarily due to compression of the mesenteric vessels, and secondarily to the œdematous swelling at the neck of the intussusception, and he enumerates the following causes of obstruction: (1) The orifice of the intussusception is rendered slit-like by the dragging on the mesentery, and is sometimes opposed to the wall of the intussuscepting part. (2) The inner

and middle cylinders are much bent upon themselves, especially in cases where the small intestine is involved. (3) These cylinders may become enormously thickened by congestion and inflammation. (4) The lumen of the bowel may become plugged by coagulated blood, or by ingesta. (5) There may be a polyp at the apex of the intussusception. Speaking of spontaneous elimination, he states that this termination takes place in about 42 per cent. of cases of intussusception, being very much more common in the enteric variety, whereas it is rarer in the more common ileo-cæcal form. Forty per cent. of the cases of spontaneous elimination terminate fatally from perforation, hæmorrhage, diarrhoea, and obstruction. Mr. Treves concludes, from an extended examination of museum specimens and recorded cases, that stricture, following the elimination of a gangrenous intussusception, is of extreme rarity.

The first indication for treatment recommended is to quiet all peristalsis by opium, and then to try reduction by means of a large injection of warm water, or air, for both of which purposes he recommends the instrument of Mr. Lund, the rubber collar effectually preventing escape of fluid or air at the anus. Failing relief by these measures, he urges the immediate resort to laparotomy, which he justly considers as imperative as the performance of celotomy when taxis has failed in strangulated hernia. The great mortality hitherto attending this operation is, with good reason, assigned to the late period at which it is often undertaken, and no doubt future statistics will present a more favorable aspect. With regard to the performance of the operation, the following rules are laid down: Except in exceptional cases, the incision is best made in the middle line. The intussuscepted mass should be, as far as possible, exposed in the wound, and attempts at reduction made by pulling on the entering bowel with one hand, while the intestine about the lower end of the intussusception is gently squeezed with the other. No violent or long continued attempts at reduction should be made, and, after the reduction is completed, if the viability of the intestine is doubtful, or if it is gangrenous or irreducible, resection should be practiced, the ends of the divided bowel being stitched to the wound, and the artificial anus can at a future time be closed. The attempt to at once stitch the divided ends together not having hitherto proven satisfactory, simple enterotomy and colotomy are both condemned, as, although relieving obstruction, they leave in the abdomen an invaginated intestine, in which the process of inflammation and gangrene can still advance.—*Brit. Med. Journ.* 1885. Jan. 3.

VIII. ACUTE INTESTINAL OBSTRUCTION. By Dr. E. H. GERVES. An interesting and extensive discussion took place at the Liverpool Medical Institute, October 23, 1884. The debate was opened by a paper by Dr. Gerves, in which he recorded a case that had been under his care, and in which Mr. Pughe had performed a quite successful operation. The patient, a boy aged 6 years, came under observation, having had symptoms of acute intestinal obstruction for five days, with absolute constipation, meteorism and bilious vomiting. Owing to the considerable time that the acute symptoms had existed, no attempt was made to relieve the obstruction by



manipulation or large enemas, laparotomy being at once determined upon. Upon opening the abdomen, Mr. Pughe found a knuckle of the ileum close to the cæcum tightly strangulated. The constricting band was divided and ligatured, the bowel being set free. The constricting chord was found to be hollow, and further examination determined that it was an abnormal vermiform appendix. While the intestines were being handled it was found that the pulse at the wrist became so feeble that it could not be counted, but after they were returned to the abdominal cavity, and the wound closed, the heart's action soon became restored. The boy made an uninterrupted recovery.

Most of the members who took part in the discussion appeared to favor early operation, and deprecated long continued trials of copious injections, manipulations, and general medical treatment.—*Liverpool Journ. Med. Sci.* 1885. Jan.

IX. EXCISION OF CÆCUM FOR EPITHELIOMA—DEATH ON 13TH DAY. By W. WHITEHEAD, F.R.S.E. (Manchester). The patient had symptoms for 18 weeks before coming under notice, consisting of attacks of paroxysmal pain in right lumbar region and spreading over the abdomen. A tumour had appeared some weeks previously, which on admission measured  $4\frac{1}{2}$  by 3 inches, and was freely moveable. There was a history of diarrhœa, though when admitted the motions were natural, and there did not appear to be any indication of obstruction, but the calls to urinate were frequent.

The abdomen was opened over the seat of the disease, and a double ligature placed round the ileum and also round the ascending colon. After division of the parts between the ligatures, the diseased bowel was removed; some lymphatic glands were also removed from between the folds of mesentery, and during this stage of the operation, the superior mesenteric vein was wounded and ligatured, both ends of bowel were brought at the wound and sutured to it with silver-wire. The patient gradually sank, and died on the 13th day.

At the post mortem examination, extensive peritonitis and a large abscess containing putrid pus, outside the peritoneum, in the iliac fossa, were found. The piece removed consisted of the cæcum, vermiform appendix, 2 inches of the ileum, and the greater portion of the ascending colon. The intestine was constricted at the seat of disease, and projecting into the lumen of the bowel was a mass of neoplasm, which on microscopical examination proved to be carcinomatous. The cells were small and irregular, occasionally only showing the ordinary columnar type.—*Brit. Med. Journ.* 1885. Jan. 24.

X. A CASE OF RESECTION OF THE LARGE INTESTINE FOR SCIRRHOUS GROWTH. By Mr. SYDNEY JONES. The patient, a woman, aged 54, presented a tumour about  $2\frac{1}{2}$  inches in diameter and of very irregular outline, about the level of the anterior superior spine of the ilium, on the right side. There was a good deal of constipation, and the motions were of a black colour. Upon opening the abdomen, Mr. Jones found the tumour situated in the upper portion of the ascending and part of transverse colon. It was adherent to the anterior parietal peritoneum. The

ileum was divided close to the valve, and the cæcum, ascending and part of transverse colon were removed; the ileum was stitched to the colon, and the junction kept close to the abdominal incision by sutures.

The patient died on the 31 day, and at the post mortem a slight extravasation was found to have taken place at the mesenteric attachment. There was, however, no general peritonitis.—*Lancet*. 1885. Jan. 10. C. B. BALL (Dublin).

## Extremities.

I. ON THE TREATMENT OF DUPUYTREN'S CONTRACTION OF THE FINGERS. By JAMES HARDIE, F.R.C.S. (Manchester). In a brief, semi-historical introduction to the description of his own method and experience, he writes: "We have, I believe, been led off the track by two causes—firstly, by the operation introduced by Dupuytren himself, with whose name the affection is so generally associated; and secondly, by the introduction of subcutaneous surgery." With regard to the latter, he adds that it has been objected to open wounds, as compared with subcutaneous; that the former are unnecessarily severe, and that they may be followed by serious consequences. He points out that the antiseptic method alters the position essentially.

Mr. Hardie's own operation is that of Goyrand (published in 1834), done under antiseptic precautions, and with special care to thoroughly separate the fibrous tissues from the superjacent skin. He relates four cases (eight hands). The skin is incised longitudinally, and the fibrous bands, after careful dissection from the skin, divided transversely in several places. Esmarch's band is used; silver sutures for skin incision; catgut or horse hair drain, removed on second day; then a little compression. The cases were all very recent, but no tendency to relapse had been noticed after several months. It is not stated where these operations were done, but it was probably the Manchester Royal Infirmary, to which the author is surgeon.—*Reprint from the Medical Chronicle*. C. B. KEETLEY (London).

## Genito-Urinary Organs.

I. PERINEAL URETHROTOMY AS A PRELIMINARY TO PLASTIC OPERATIONS FOR CLOSING FISTULE IN THE ANTERIOR PART OF THE URETHRA. At the meeting of the New York Surgical Society, March 24, 1885, Dr. A. C. Post presented a patient upon whom he had operated for the cure of a congenital hypospadias, the floor of urethra having been deficient to the extent of about 2 cm. behind the corona glandis. As a preliminary to the operation he had made a perineal incision into the membranous part of the urethra, through which he had introduced a catheter into the bladder, leaving it *in situ* for 14 days. The plastic operation upon the anterior part of the urethra resulted perfectly, and when the catheter was withdrawn the patient passed his urine freely through the reconstructed canal. Within a very few days the wound of the perineum was entirely healed. The success of the operation he attributed in a great measure to the perineal opening.

Dr. C. McBurney stated that perineal openings made for such purposes usually

closed readily; in one patient with an extensive fistulous opening in the urethra, which required four operations for its cure, he had made an opening in the perineum at the first, and this closed after each operation so as to make it necessary to reopen it each time before doing the next operation.

Dr. R. F. Weir said that within a few months he had closed in one patient three openings in the normal urethra from tertiary ulceration situated in the corona glandis. The operation consisted in vivifying the edges of the fistulæ after making a perineal opening. The broad, freshened edges of the prepuce and inferior surface of the glans were sewed up with several rows of catgut sutures, and in this manner a perfect success was obtained. He thought the multiple rows of fine catgut sutures, as well as the perineal opening, contributed to the good result.—*Proceedings New York Surgical Society*. 1885. March 24.

II. RESULT OF OPERATIONS FOR THE REMOVAL OF TUMORS FROM THE BLADDER. By A. W. STEIN, M. D. (New York). An examination of the results obtained in 98 cases, compiled from current medical literature. The operative methods adopted in males have been as follows: 1, External perineal urethrotomy; 2, perineal cystotomy; 3, hypogastric cystotomy; 4, hypogastric and perineal cystotomy conjointly; 5, Hypogastric cystotomy and perineal urethrotomy. The author concludes that the choice of operation must depend upon the location, mode of attachment and size of the growth to be removed. Sessile growths are not manipulated to advantage through a perineal opening, especially when the growth is located in the upper region of the viscus, or on its anterior or lateral walls. In fat subjects with deep perineum, and in cases of prostatic hypertrophy and lengthening of the prostatic urethra, a perineal section is unsatisfactory. The danger of working in the dark is also to be borne in mind. But external perineal urethrotomy is to be favored as the first step in diagnosis at least. Supra-pubic cystotomy can then be done, if found necessary, with increased chances of recovery on account of the free drainage provided by the perineal incision. Wounding the peritoneum is to be avoided by elevating the bladder by a rectal colpeurynter; urinary infiltration by thorough drainage, both by the urethra or perineal opening, and by drainage tubes inserted through abdominal wound. The vesical wound may be stitched or left open—both methods have shown excellent results. The results thus far attained by surgical interference are most encouraging, and in every way justify repetition of the same. The least suspicion of a tumor should lead to an investigation, that, if present, it may be removed while the general condition of the patient is yet favorable for an operation, before he has become exhausted from the loss of blood, or the kidneys and bladder have become so much diseased as to make recovery impossible even in the event of the successful extirpation of the growth.—*Med. Record*. 1885. March 14.

III. OPERATIVE TREATMENT OF VESICO-RECTAL FISTULA IN THE MALE. By Dr. J. ROTTER (Würzburg). These fistule are in general of rare occurrence. Bartels, under "Wounds of Bladder" (*Arch. f. Klin. Chirg.*, Vol. XXII.) mentions them. Simon (same Archives, Vol. XV.) successfully operated such a case. Rotter here

reports another operated by Maas last year. Patient had had bubo, and it is surmised that an abscess between rectum and bladder had caused the fistula. Very poor retention of urine in rectum. Fecal matter or gas was not observed to enter the bladder. Dilatation of anus by Sims' speculum behind and retractors at sides. A silver catheter in the urethra served to press back anterior wall of rectum. Removal of a ring of tissue entire, not in pieces. Trimmed into flat funnel shape (after Bozeman); sutured in longitudinal direction with catgut; 7 sutures  $1\frac{1}{2}$  cm. apart. Tested by filling the bladder. Patient kept constipated after operation. Cure. Dittel (*Wien. Med. Woch.*, 1881) operated by another plan four cases of urethro-rectal fistula, and Sims one from rectum—all unsuccessful. Maas in 1877 operated such a case from the rectum with satisfactory though not entire success.—*Arch. f. Klin. Chirg.* 1885. Bd. 31. Hft. 3.

IV. A MODIFIED SECTIONALTA. By Prof. G. v. ANTAL (Budapest). The frequent non-achievement of primary union is, in A.'s opinion, not due to the material or arrangement of the sutures, but to the attenuation of the bladder-wall and consequent narrowness of the wound surfaces. He proceeds as follows: With the bladder full and tense, the anterior peritoneum free, bladder wall is laid bare. Through its external layer an oval incision is made, parallel to the body axis. Length of cut depends on the object of the operation; its breadth should be 1 to  $1\frac{1}{2}$  cm. Then, holding the scalpel flat, he pares off this circumscribed piece from the muscosa, towards the middle line, however, also including some of the muscular layer. On completing this shallow, funnel-shaped cut, the just visible bluish mucous membrane along the median line is incised. The purpose of the operation is carried out. Sutures are passed through the external and muscular layers only. A. here prefers sublimated silk to catgut. He has performed thus on the cadaver and once on the living subject—a boy of 5 to 6 years—for removal of a calculus. Primary union in a week.—*Wien. Med. Woch.* 1885. April 4, No. 14.

V. AFTER TREATMENT IN SUPRAPUBIC LITHOTOMY, AND THE APPLICABILITY OF THIS PROCEDURE IN OPERATING VESICO-VAGINAL FISTULE. By Dr. W. MEYER (Bonn). The first part advocates Trendelenburg's method of using T drainage tube and keeping patient in Sims' lateral position.

Boulay (1883) collected 23 (resp. 22) cases of vesical suture after the superior operation; to these M. adds 19 others, including one new case. Of these 16 gave primary union, 17 secondary, 1 was fatal from erysipelas, and 7 from the operation. In operating for intravesical trouble, Trendelenburg, after first opening the bladder (suprapubic) reverses the patient and elevates pelvis and abdomen so that the body is inclined, the thighs being held over the shoulders of an attendant backed up between them. This exposes the interior of the viscus, avoids its respiratory displacement and drains the fundus clear. By this method T. has even sought to operate vesico-vaginal fistula too bad for operating from the vagina alone. Cases accompany the article.—*Arch. f. Klin. Chirg.* 1884. Bd. 31. Hft. III.

W. BROWNING (Brooklyn).

VI. INDURATION OF THE CORPUS CAVERNOSUM AND DIABETES. M. Duplay showed a strong and robust patient, aged 40, with induration of the cavernous body about the middle of the penis, which during erection caused the organ to assume a lateral curvature, thereby preventing coitus. M. Verneuil said that he had met with this lesion in a diabetic patient, and had several times found patients thus affected to be suffering with glycosuria. Those who were not diabetic suffered with gout. The recognition of this made one hesitate to operate in such cases. Operations on the corpus cavernosum might produce gangrene of the penis, or the cicatrix following the operation might cause just such a deformity as the one it was proposed to remedy. In one case the induration had been followed by epithelioma. For these cases he recommended elastic compression.—*Revue de Chirurgie*. 1884. Dec. 10.

VII. PARALYSIS OF THE BLADDER, DUE TO THE EMPLOYMENT OF CARBOLIZED DRESSINGS. By M. CARTAZ. Two cases. In one case an intra-uterine injection of carbolic acid was used after a miscarriage, and in the other, a case of fracture of the neck of the femur, carbolized dressings were used to some sores over the sacrum. In the first case, the bladder was full of blackish urine. In both cases, on ceasing to employ the carbolic acid, the paralysis cleared up.

M. Verneuil attributed the paralysis to traumatism. M. Nicaise had never seen retention of urine following the use of carbolic acid, but had several times met with suppression unaccompanied by vesical paralysis. *Revue de Chirurgie*. 1884. Dec. 10.

VIII. COMPRESSION IN ACUTE ORCHITIS, BOTH SIMPLE AND COMPLICATED. By M. O. LAURENT. This is effected by making gradual traction on the inflamed testicle, thereby separating it as much as possible from the external abdominal ring, towards which the cremaster muscle has a tendency to pull it. Having then isolated the organ, several turns of a bandage are made around it above, preventing its reäscend. From this *point d'appui*, the whole testicle is covered by oblique circles of the compressing bandage, which is afterwards painted over with a solution of starch. Should the cord be affected, a layer of wadding must be laid over it, and the whole covered by a starched spica-bandage. M. Thiry, of the Hospital of Saint Pierre, has long been in the habit of treating cases by this means. The author asserts that he has not seen this method fail in a single instance, however acute the inflammation. The effect of the compression is at once to give relief to all pain.

Several cases are recorded in which the cure was complete, on an average, in 8 days; the shortest time being 5 days, and the longest 10 days. The application may have to be repeated daily, according to the rate of diminution of the swelling. Three applications, however, were as a rule sufficient.—*La Presse Médicale Belge*. 1884. Nov. 9.

F. SWINFORD EDWARDS (London).

IX. CASES ILLUSTRATING RENAL SURGERY. By A. E. BARKER, F.R.C.S.

*Case I. Excision of the Kidney for Ruptured Ureter, and Urinary Abscess in a child, aged three and one-half years. Recovery.*

The history of this case must rank as one of the most important in recent renal literature. The child in question was run over, and beyond the usual symptoms of

bruising of the abdomen, and one small urinary clot on the first day, there was nothing to point to any lesion of the urinary tract. He made apparently a good recovery, and left the hospital convalescent in a fortnight. A few days later he was readmitted, with a fluctuating mass in the situation of the right kidney; but there was little constitutional disturbance. The swelling continued to increase, but the urine was perfectly normal. A few days later the swelling was aspirated, and yielded a fluid containing about one-half per cent. of urea. Sp. gr. 1.010, with albumen in small amount. Three months later the kidney on the affected side was excised, and it is noteworthy that the remaining one *at once* took over its function, and secreted urine normal both in solid and fluid constituents, and a few weeks later the child left the hospital with only a small sinus in the loin. The kidney when removed was proved to be quite healthy, and the ureter torn just below it. During the two months which elapsed between the first aspiration and the removal of the kidney, a series of most interesting physiological and pathological observations were made upon the amount of the secretion from the injured side, and the way in which it varied in accordance with the altered conditions which from time to time manifested themselves. Full tables are appended in the original communication. So long as the right kidney was aspirated every few days, the amount of water secreted by it was about one-half that from the healthy kidney, and it always contained some albumen, whilst the amount of urea never reached but once  $\frac{1}{2}$  per cent. as opposed to an average of over 2 per cent. on the healthy side. No sooner was the right kidney freely drained, so that it was not performing its work under excessive pressure, than the secretion from the two kidneys became almost exactly equal in amount, excepting only that the injured kidney continued to excrete a small amount of albumen, probably from the abscess cavity.

The immediate cause of nephrectomy was the fact that the drainage tube became blocked with phosphatic deposits which gave rise to considerable constitutional disturbance.—*Lancet*. 1885. Jan. 17.

*Case II. Complete History of Renal Calculus; Exploratory Lumbar Incision, with Palpation and Multiple Acupuncture of the Kidney. No stone discovered. Operation wound healed in a few days, with no ill effect.*

There is but little else to state about this case, except what is comprised in the above heading. Mr. Barker throws out a suggestion that such cases are possibly due to the presence of a small tubercular ulcer. It is, however, certain that they are generally benefited by the exploratory operation.

*Case III. Pyonephrosis—Aspiration of Thirty-six Ounces of Pus—Relief—Subsequent Re-accumulation, then Rupture of the Collection into the Sheath of the Psoas Muscle, with Pointing in Scarpa's Triangle; Nephrotomy—Drainage of Large Quantity of Pus from the Kidney—Relief.*

Some points of interest are observable in this case. When the nephrotomy was performed, the pus, which had not found its way out per urethram before, began to pass into the bladder, giving rise to cystitis and a sympathetic irritation in the oppo-

site kidney. In addition to this, the general health of the patient suffered considerably whilst all this was going on. These symptoms were all much relieved as soon as there was a free drain from the kidney in the loin.

When the patient was last seen, he was thin, but felt quite well, and was absolutely free from pain. The sinus still discharged about a drachm of pus daily.

*Case IV. Tubercular Kidney; Extreme Prostration; Exploratory Nephrotomy; Drainage; Temporary Improvement; subsequently Amyloid Disease of the Opposite Kidney and other Organs—Death from Asthenia, Five Months Later.*

It is curious that in a case which so soon developed a fatal issue an operation should have proved to be of so much temporary benefit. That such was clearly the case is shown by the fact that whereas the patient previous to it was confined to her bed with œdema of the legs, great weakness and general malaise, she became much brighter after it was performed, and her appetite returned. The temperature, which up to this time had been subnormal, again reached the normal standard.

So great was the improvement that the question of nephrectomy was several times discussed, though the time never arrived for its performance.—*Lancet*. 1885. Jan. 24.

W. BRUCE CLARKE (London).

## Wounds, Injuries, Accidents.

I. ON SOME MODIFICATIONS OF THE ANTISEPTIC METHOD. By Prof. J. MIKULICZ (Cracow). This forms essentially a report of his 2-3 years work at his new post in Cracow. The circumstances there, as he pictures them, must put surgical antiseptis to a severe test. Still he dispenses with spray. He includes a study of sublimate as a practical antiseptic. Theory and experiment first led to its use; experience must decide as to its practical value.

We find that in practice solutions of bichloride are used, at least ten times the strength which experiment had seemed to indicate as sufficient. Koch, however, pointed out that the weaker solutions were adequate only where all the disinfectant in solution could exert its full action, and that in the case of sublimate other strengths would have to be used in disinfecting fluids rich in albuminates and sulphur, or other compounds forming insoluble combinations with mercury. His calculations were based on pure cultures of the bacilli and spores of malignant pustule, with no admixture of substances deleterious to the antiseptic. In wounds, however, the formation of mercury-albuminate immediately weakens the solution, so much so that it may be reduced from one of the strongest to a very moderate antiseptic.

For the prophylactic portion of wound-antiseptis—disinfection of sponges, tubes, sutures, operator's hands and part to be operated—such objection does not hold. Sublimate is incomparable, its value being increased by the rapidity of its action. It is not suitable for metal instruments, since they are attacked by it. During and after completion of an operation, on the other hand, we have to deal with albuminous secretions, a very varying factor. Experience, rather than experiments, must guide us here. Koch laid down the rule that the disinfecting solution should contain sufficient

bichloride, that 1 part in 5000 remain free. K. found that river water required 1:2000, bilge-water 1:1000, and putrid blood 1:400. Mikulicz experimented with defibrinated ox-blood and spring water. Sublimate 1:1000 retarded and diminished the development of micro-organisms; weaker solutions not perceptibly; while only a strength of 1:400-500 completely prevented their appearing. Comparative tests showed that it only needed about double this strength of carbolic to give as good results. Schill & Fischer found that 1-5 of sublimate solution, mixed with an equal volume of tuberculous sputum, quite failed to disinfect it, while a 5 per cent. carbolic sufficed. Since the excretion of pathogenic micro-organisms usually occurs in connection with albuminous material, sublimate is probably less trustworthy for such hygienic disinfection than carbolic. His own tests with bichloride simply bore on the question of impeding the development of, rather than destroying germs, since the latter would require too irritating solutions. Mercury albuminate itself is, however, not entirely inactive, and does not readily putrify.

There are, therefore, good reasons for considering carbolic a far more constant and trustworthy wound antiseptic than sublimate, although the latter is the stronger agent. If sublimate is used in preparing for an operation and full precautions be taken, then even pure water (0.6 per cent. salt solution) may answer for wound irrigation (*V.*, Jan. No., p. 88). In septic puerperal conditions, it is questionable whether sublimate should be used, since either strong solutions or frequent irrigation may prove toxic. As a wound dressing iodoform, thymol, etc., are not inferior to bichloride, and less dangerous. Again, sublimate, contrary to general impression, is volatile. Kratschmer found that sublimated gauze, after being kept 3 months in cans, had lost nearly all its sublimate. Lazarski, at his request, examined this question, and found that sublimated gauze left exposed for 20 weeks lost  $\frac{1}{2}$  to  $\frac{2}{3}$  of its bichloride, and if boxed up for the same period  $\frac{1}{4}$ .

Finally, sublimate may be absorbed in fatally toxic amount. Its local caustic action—principally seen under sublimate dressings—has repeatedly caused eczema, erythema, urticaria, etc. Constitutional effects have been noted by several observers after such dressing, and after uterine injections. A few cases have ended fatally. M. refers to 6 at least, and gives one of his own, after extirpation of breast and axillary glands, where sublimate was only used in the dressing. It was the first case in which he used bichloride. The saw-dust dressing had been impregnated with 1 per cent. sublimate solution. Individual susceptibility varies.—*Arch. f. Klin. Chirg.* 1884. Bd. 31. Hft. III.

W. BROWNING (Brooklyn).

II. CASES OF ACUTE TETANUS FROM UMBILICAL WOUNDS. By J. R. GODLEE (London). In both the cases reported in this paper the patients were infants; in one the symptoms appeared at the end of the first week, in the other at the end of the second. The younger child died at home in 18 hours after the onset of the disease, the older one lingered for 8 days, but it was only brought in for Hospital treatment 24 hours before its death. The immediate cause of its death was asphyxia.

The umbilical wound was an unhealthy one in both cases. In the younger child a



portion of the umbilicus "was still semi-detached; the part looked neglected and far from clean, it was discharging a sanguinous pus and bled readily when touched." In the other child there was "a red, irregular, sloughy-looking wound over umbilicus, which has existed since its birth."

The treatment adopted was frequent mustard baths, with repeated small doses of bromide of potassium. In the more lingering case nutrient enemata were tried, but they could not be retained. A post-mortem examination in the latter case showed palor and softness of the brain substance with some punctiform hæmorrhages, also softness of the spinal cord with congestion of itself and membranes. There were no other conditions of importance to be noted. The interest of the two cases seems to be that they were examples of acute tetanus associated with unhealthy wounds.—*Lancet*. 1884. Dec. 27. C. W. CATHCART (Edinburgh).

III. RUPTURE OF INTERNAL JUGULAR VEIN, COMPLICATING OPERATION FOR LIGATION OF VERTEBRAL ARTERY; LIGATURE OF VEIN; LIGATURE OF VERTEBRAL ARTERY; RECOVERY. MR. R. B. DUNCAN (Australia.) The operation for ligation of the vertebral artery was undertaken for the relief of epilepsy in a male of 30 years. While drawing aside the structures overlying the artery, sudden and excessive hæmorrhage signalized a rupture of the internal jugular vein. On examination a nearly complete transverse tear of the vein, about an inch above its union with the subclavian, was found. This was plugged by the finger of the operator while a ligature was carried around it by an aneurism needle. An additional ligature was applied above the rent. The artery was then exposed and ligated. The wound irrigated, drained and closed with antiseptic precautions. Rapid recovery without untoward symptom.—*Australian Med. Journ.* 1885. March.







FIG. 1.—Dissection of sprain of elbow (produced post mortem) showing the orbicular ligament displaced upwards, the head of radius forwards and downwards.

FIG. 2.—Vertical section of radius from Ada T., the neck intensely inflamed, the shaft partly denuded of periosteum, the upper epiphysis detached by supuration.

FIG. 3.—Left radius from in front during supination. FIG. 4.—During pronation. Both figures are explained in the text.

# ON CERTAIN OBSCURE SPRAINS OF THE ELBOW OCCURRING IN YOUNG CHILDREN.

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THIS subject has attracted no little attention, Goyrand and Guersant in France, and Hodges in America, having especially written on it. The latest notice of it that I am acquainted with occurs in Mr. C. Heath's *Minor Surgery* (1883), and it will be seen from the following quotation from that work that the pathology has been, by no means, clearly made out, although the peculiar features of these cases—common enough—must be known to every surgeon. Mr. Heath writes: "Mr. Duncan M'Nab, of Epping, was good enough, in 1862, to call the author's attention to a peculiar injury occurring in young children, caused apparently by their being dragged forcibly by the hand. The symptoms are pain and inability to supinate the hand, which is strongly pronated, the arm is semi-flexed, and the deformity suddenly disappears upon the hand being steadily supinated by the surgeon, or frequently whilst he is examining the case. Mr. M'Nab regards the injury as a dislocation of the lower end of the radius from the ulna. M. Goyrand described the same injury to the Surgical Society of Paris in 1861, and maintained that it consisted in a displacement of the inter-articular fibro-cartilage of the wrist, in front of the carpal extremity of the ulna. Other French surgeons, however, have believed that the dislocation is at the upper extremity of the radius, and in this Dr. Hodges, of Boston, agrees. The author has met with several cases since his attention was called to the subject, and in some of these the injury, so far as could be judged, was at the wrist, whilst in others it was near the elbow. The treatment is to grasp and supinate

the hand steadily, when the parts will resume their natural position."

With all deference to so distinguished an authority, I venture to differ from the foregoing in several particulars. First, I believe that the lesion in the great majority, if not all cases, consists in a slipping of the radius out of the grasp of the orbicular ligament, which rests in the angle between it and the capitellum. Fig. 1 shows this, and represents the result of one out of many experiments on the dead subject. The accident is commonly produced by a dragging or other force applied to the hand in a condition of supination. *A priori*, then we should expect a downward displacement of the radius alone, for it need not be pointed out how little the ulna is concerned under such conditions. In those cases in which the force has been great it is probable that there is also a rupture of the thin part of the capsule connecting the orbicular ligament with the neck of the radius.

It will greatly simplify the matter if this one explanation be admitted. The various theories of the authors mentioned differ widely from each other. Dr. Hodges argues in favor of "a partial dislocation of the radius in one direction or the other." Mr. Heath thinks "the injury is in some cases at the wrist, and at others near the elbow." M. Guersant described typical cases, but suggested that many lesions may here produce the same symptoms. M. Goyrand at first believed that the lesion was at the elbow, but later abandoned this for the explanation mentioned by Mr. Heath—that the triangular fibro-cartilage at the wrist is displaced. Finally Mr. M'Nab suggested yet another theory. M. Tillaux, in his admirable *Anatomie Topographique*, strongly supports M. Goyrand's view: "A frequent accident, first noticed by M. Goyrand, and still little known, is a displacement of the head of the ulna over the triangular ligament. Let us suppose a movement of pronation, if this is too strong, one can imagine that the ligament arrives in front of the head of the ulna without rupture, it thus forms before the bone a sort of bridle, which hinders the movement of supination; that is to say, the return of the radius to its place. This accident appears exclusively to be produced in children, when one raises them sharply by the arm, to make them jump

a stream, for instance. They are brought with the hand in forced pronation, it being impossible to supinate it, the least movement being painful, the child keeps its arm motionless. The treatment consists in fixing the forearm with the left hand whilst with the right one sharply supinates—a slight but very audible crack is heard, and the displacement is reduced. It has been for long believed that one had to do with a displacement of the upper extremity of the radius in these cases." p. 549.

In the chapter on the elbow-joint, M. Tillaux does not mention any displacement, short of obvious dislocation, as occurring in young children, and hence to him these sprains have as their basis but one lesion, and that at the wrist-joint. But his explanation bears on its face a certain amount of refutation. The words, "*on conçoit*," show that, (so far as I know, like all other writers on the subject) he cannot appeal to post-mortem evidence or to experiments on the dead body; still more important is the account of the way in which the displacement is produced. Who would think of raising a child by its fully pronated hand? This movement is a means of torture almost confined to school-boys, at an age when the ligaments are much stronger. I have failed to produce any lesion in wrist or elbow on subjects older than 5 or 6 years by either pronation or supination combined with traction. But if the body of an infant or young child be taken and forcible traction applied to one hand during supination (it must be remembered that the force is great in the living subject—since frequently the child is lifted up or swung round by the person producing the accident), a peculiar snap will be heard. If the forearm is then dissected it will be found that the orbicular ligament has slipped up, and that this with or without rupture of the sub-orbicular membrane (if such a term may be allowed) is the sole lesion produced. If the elbow is now flexed and the hand pronated, the ligament again slips down into its right place, and again a snapping sound is heard. The experiment may be repeated several times, for by slight traction and supination the dislocation can easily be reproduced. In this second point I must beg to differ from Mr. Heath's description;—it is partly by supination that the displacement is produced,

and it is comparatively very difficult to reduce it without pronation. The reason is obvious on looking at the articular surface of the radius. Fig. 3 shows this part from in front during full supination, and it will be seen that the part opposed to the curve of the orbicular ligament (that to the right as in Fig. 4) is of considerable depth, and its upper edge a right angle; whilst the same part in full pronation (Fig. 4) is shallow, and has its upper edge rounded off. Hence in pronation a part is presented over which the ligament readily slips. These sketches are taken from adult bones, but the same holds true for young ones.

It may be urged that if the radius is displaced downwards at the elbow joint it must necessarily be displaced to the same extent at the wrist. But the term displacement is too high-sounding. It simply amounts to the depth of the cup (trifling in children), for the radius remains in contact with the capitulum, by the border of its cup. This, it will be admitted, can make no obvious difference to the relation of the ulna and radius below. If the force applied be extreme the liberated radial head will be driven forwards, and Mr. Holmes (*Surgical Diseases of Children*) figures such a displacement (compound in his case), and states that it is frequent in children. Professor Hamilton also says: "In children, and especially in those of a strumous habit, whose ligaments are feeble, a subluxation forwards, or even a complete luxation, is occasionally produced by being lifted suddenly from the floor by the hand, or by an attempt to sustain the child when he is about to fall. I have seen several examples of this latter form [complete luxation] of the accident produced in this way."

But the essential feature of these far more common sprains in early life is the upward displacement of the orbicular ligament, to which I have hitherto found no allusion.

It is possible also that in a few cases the oblique ligament may be torn; but I could only produce this after very great traction; the interosseous membrane running downwards from radius to ulna will obviously be relaxed. There seems no doubt that considerable pain is produced by these sprains. The child, when brought, is often said to have "cried ever since we lifted it up," and the analogy to the interlocking of a



semilunar cartilage in the knee might be suggested. But it probably does not hold, since the orbicular ligament is not so definitely interlocked, it is much softer, and, as already pointed out, the interval between the two bones is usually very slight. If, however, the radius be somewhat dislocated forwards, the radial nerve may be stretched over it during extension, and this might possibly account for some of the pain.

The cases are of every-day occurrence at a large hospital, and those I have seen were hardly so fully pronated as the descriptions quoted would lead one to expect. The child seems naturally to pronate the hand after its forced extension and supination, but finding that something is wrong, keeps it at rest and as though helpless.

As regards treatment: The elbow should be flexed and then gently but fully pronated; if a click is audible one may feel certain that the orbicular ligament has descended, and that nothing further is necessary than rest with perhaps cold applications.

An interesting question is whether occasionally the displacement is left unreduced. It seems probable that this may happen, and may account for a slight abnormal projection of the radial head in adult life. I have seen one such case, and Mr. Holmes (*Surgical Diseases of Children*, 1868, p. 421) figures the elbow of a child "out of which the radius could easily be made to project, and as easily to recede into its cavity." Plainly it must first have slipped below the orbicular ligament. What produces the clicking or snapping sound heard in all these cases either on reduction or at the time of the accident? Perhaps it is more allied to the sound heard on separating the femur from the acetabulum than when two bones are struck together. It is sometimes so loud that "fracture of the radial neck" and "separation of the upper epiphysis" are diagnosed from it—both are very unlikely. They both, however, point to the fact I wish to lay stress on, that in at any rate the great majority of cases the lesion is at the elbow. Further evidence is required of the real existence of the displacement described by MM. Tillaux and Goyrand—I have hitherto failed to produce it in the dead subject.

So far one has been dealing with what can be proved by ex-

periment, but there remains to be noticed a matter which can only rest on probability.

These sprains are very common in young children; disease of the elbow joint is also common in them (taking one year at the London Hospital, one-third of the cases admitted from this cause were children under nine), is there any definite relation between them? It has been mentioned that in severe cases of the elbow-sprain the thin membrane connecting the orbicular ligament with the neck of the radius is torn away from its attachment to that bone. This membrane, which for brevity's sake, one may term the sub-orbicular, is so slight as hardly to receive notice in some anatomical works, but it serves the important purpose of shutting in the synovial cavity at the lower and outer part, and its rupture, of course, means a tear in a structure directly continuous with the periosteum.

Cases are sometimes met with in which acute periostitis of the radius follows a more or less severe injury to the elbow in children, and it seems unlikely that contusion of the bone should have caused it. I may briefly quote two—in one of which there is evidence that the neck of the bone was the part chiefly affected.

Ada T., act. 6, after an injury to the left arm received during a fall out of a window (there was no bruising of the part), was admitted a few days later with swelling of the hand and forearm, the arm also being swollen up to the shoulder. There was obscure fluctuation in the forearm, and several incisions having been made in this and the arm, pus, containing many micro-organisms, was let out by Mr. Treves, to whom I am indebted for permission to publish the case.

Slight relief followed, but she was delirious; pneumonia came on with thrombosis of the small peripheral veins, and she died on the seventh day after admission. On post-mortem examination purulent pleurisy, sub-pericardial abscesses, and a multitude of small pyæmic abscesses in liver, kidneys, spleen and mesentery were found. There was pus in the left elbow-joint, in which the upper epiphysis of the radius lay loose, the capitellar surface was roughened, the periosteum peeled off radius, (especially at upper end); the muscles over it were matted together; there was no disease of ulna or humerus. On

section, the neck of the radius was seen to be intensely inflamed; the contrast between it and the rest of the bone being to some extent shown in Fig. 2.

The second case so closely resembles the first that a brief summary will suffice. A young boy, a few days after a fall (apparently onto one hand), became very ill, and died within a week of acute pyæmia. After death it was found that the humerus and ulna were normal; that the upper half only of the radius was affected with acute periostitis; no section was made of the bone. In both cases there was great swelling of the whole arm and forearm, and it might be well to suspect the radial neck as the part primarily diseased in similar ones, and so avoid making incisions over bones not affected. Of course it may be that a wrench of the biceps tendon sets up inflammation about the radial neck, but there was nothing to point to this in the case of Ada T.; its firm attachment must render it far less liable to be torn from the bone than the "sub-orbicular membrane."

I have seen one case where there was reason to think that the orbicular ligament had slipped downwards instead of upwards; it occurred in a young boy who came to the hospital with one radius slightly displaced outwards at the upper end, (there was no suspicion of fracture), so that whilst part of its head touched the capitellum, one's finger could be placed on a small part of its cup-shaped depression. The elbow was kept somewhat flexed; simple traction failed to reduce the deformity, but the test of full pronation was not tried. He left in order to get permission to take an anæsthetic and did not return. The external lateral ligament appeared to be stretched.

In concluding this account of the peculiar displacement of the orbicular ligament, I do not suppose for a moment that such a simple explanation of these common but perplexing cases of elbow-sprain in young children has not occurred to many observers. But it was owing to the uncertain statements found in the chief surgical works, and to my own doubt in dealing with these cases, that I thought it worth while to see if experiments on the dead subject would throw light on them, and to record the results in this paper.

# ON THE SURGICAL DISSEMINATION OF CANCER.<sup>1</sup>

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SURGEON TO THE MOUNT SINAI AND THE GERMAN HOSPITALS.

THE subject in question, not being mentioned by the authors of text-books on general and special surgery, and unknown in periodical literature, seems of sufficient importance to deserve consideration. The present essay is an *a priori* consideration of a possibility or probability occurring in the course of the development and treatment of cancer; an outline of a train of thought based on clinical observation, that may deserve more extensive study in the future.

The subject-matter itself is not strictly new, observations bearing upon it having been made and published from time to time in an unconnected manner. The leading idea of this essay was originated in the year 1877 by observing the course of a striking case of rapid dissemination of cancer. Since then a number of other cases have accumulated tending to confirm those first impressions. When, finally, Czerny's observation (published in 1883), and König's remarks on operative dissemination of tuberculosis (both published in the *Centralblatt für Chirurgie*, 1884) appeared, the interest of the author was quickened by their strong confirmatory, though indirect, evidence.

They both, like the author, did not advance anything absolutely new, as everybody knows that many patients operated on for joint-tuberculosis died subsequently, and soon after the operation, of meningeal or other forms of disease. But they drew attention to the fact that the *post hoc* might be in many cases also a *propter hoc*.

The author's case in question was as follows:

<sup>1</sup> Read before the New York Surgical Society February 8, 1885.

I. A., an aged lady, of robust health and a cheerful disposition, presented herself for treatment on account of an elevated ulcer of the outer margin of the sole of her right foot. It had existed for over thirteen years, growing very slowly, until it had attained the size of three inches by two inches and a half in diameter. It was segmented, each segment showing a distinct epidermal margin, the edges of the ulcer somewhat overlapping the normal skin. While open, the purplish-red ulcer discharged large quantities of a clear serum, but, if the patient refrained from walking, it readily cicatrized over, to become sore again on her using the foot. Previously the pain or inconvenience had been very slight, nor were any glands infiltrated. Lately, however, the sore had become very painful.

Excision was proposed, and carried out in the autumn of 1877, when the base of the new growth was found to be attached to the plantar aponeurosis, which accordingly had to be removed too. The wound healed rapidly by granulation. The diagnosis of granuloma made previous to the operation, and based upon the benign development of the disease, was confirmed on microscopical examination made by Dr. I. Adler, of this city. A favorable prognosis was expressed, and the patient was encouraged to use her foot. Immediately upon cicatrization being completed, a number of small, purplish, pigmented nodules made their appearance in and about the scar, and well up the leg, increasing daily in number and size. Any doubts about the formidable character of the new growth were dispelled then, and a high amputation of the thigh was at once proposed to, but declined by the patient, who, however, finally submitted to the operation in May, 1878. A mass of enlarged glands was also removed from below Poupart's ligament. Both wounds healed by the first intention, but the operation did not delay the patient's impending fate. A few days after the removal of the limb the patient inquired about the significance of a disturbance of vision which she had noticed for four weeks. but, in her excitement preceding the amputation, omitted to mention to the author. It will suffice to say that a retro-bulbar node, causing first diplopia, finally protruded the eyeball from its socket in a frightful manner, and that the entire body of the patient became covered with innumerable nodes and nodules in an astonishingly short time. The patient's death by suicide fitly closed the tragedy, which did not fail to make upon the author a deep and lasting impression. Post-mortem examination revealed that all the organs, especially the viscera, were permeated with thousands of nodules of pigmented cancer.

Undoubtedly, then, we must have had originally a true gran-

uloma, which at the time of the first operation was undergoing the not unusual change into cancer, some portions of the tumor then removed still presenting the characters of a connective-tissue growth, as Dr. Adler's examination had proved. But is the fact of this change of a benign into a malignant neoplasm alone sufficient to explain its astonishingly swift dissemination? Certainly not, as all processes of dissemination observed in malignant new growths, local and systematic, are notoriously slow, and not to be compared with that in the foregoing case. By "slow" is understood a spread in "*étapes*," as the French say, or marches, to use a strategical term. That is, a modus which is not continuous, but interrupted, and is characterized by well-defined phases of activity and seeming rest.

First comes the simplest and most immediate spread *by contact* with neighboring tissues, which generally lasts for a considerable time, but soon is followed by the second phase—that is, that of the infection of the pertinent *lymphatic vessels and glands*. These serve as a barrier for a certain period of time, till, a large vein becoming involved, transplantation by embolism extends the disease to one or more rather distant organs. This last one would form the *third, or generalizing* phase of infection.

In the case related to you, local and general dissemination seem to have taken place simultaneously, and in a manner closely resembling certain physiological and pathological experiments performed on animals, where substances capable of multiplication are injected into the parenchyma or directly into the circulation. The assumption of a mechanical rapid distribution of the infective bodies is almost imperative, and this rapid mechanical distribution of the infective elements may have been accomplished by the manipulations involved in the performance of the operation.

Observations similar to, if not as striking as, the one related, have multiplied in the experience of the author, extending over forty cases of amputation of the breast done since the year 1878, and the practice of every busy surgeon must yield a not inconsiderable number of instances of the same character. As none of the cases of this character possess the elements of

proof positive, it would be unnecessary to weary your patience by records of similar cases, but it is important to tell you that the practical wisdom of an older generation of surgeons has impliedly admitted the truth of our assumption by advising amputation of an extremity affected by what was then termed "cancer," in preference to a mere extirpation of notoriously malignant growths. And the value of this advice is twofold: first, it more fully eliminates all foci of disease than an excision, however comprehensive; and, last, but not least, the field of operation being more or less distant from the seat of the disease, handling of the tumor and manipulative dissemination of its elements are less likely to occur than otherwise.

Now let us consider what amount of force and energy is employed in the handling of tumors by physicians, and whether this handling does not possess some or all the characters of that form of manipulation which the French denote as "massage."

A careful physical examination of the tumor, especially if made by the aid of anæsthesia, will be, and notoriously is, frequently accompanied by the use of a good deal of necessary or unnecessary force. The handlings or manipulations ordinarily in use during the performance of bloody operations on tumors to be dissected out of surrounding tissues have positively the character of massage, and occasionally a very rough form of massage, too. And the employment of anæsthetics has certainly not had the effect of increasing the gentleness of operative interference. Suffice it to say that the manipulation employed on a tumor of the breast and the lymphatic glands occupying the adjacent axillary cavity, during an operation lasting one or two hours, certainly may have the dignity of a manipulative *séance*. And all of you know that a skillful massage of thirty minutes will often cause a massive extravasation of blood to disappear from the vicinity of a sprained joint, and that three or four sittings may dispel the largest part of a solid infiltration of an inflammatory character from this or that part of the body. Now, just bear in mind how many formed corpuscular elements, be they cells or broken-up portions of a firm clot, must be propelled through the lymphatics and veins into the general circulation at each

massage, and the idea of the probability of the propulsion of cancerous elements of an unfixed, minute (that is, embryonic) character, and situated especially in recently involved places about the margins of a tumor, is very plausible indeed. The analogy of these artificial processes is *a priori* evident, and the fact that mechanical irritation—that is, another form of massage—favors the spread of malignant disease, stands fully in accord with this assumption. Finally, it seems appropriate to adduce here Billroth's authority as a pathologist in these his words: "I consider it most highly probable that both the continuous and the discontinuous spread of carcinomata are effected (*vermittelt*) by the dissemination of corpuscular elements, but admit that, so far, we are unable to prove this in all cases."<sup>1</sup>

The author does not wish to have it understood as though he considered this mode of dissemination the rule, but he believes that in a number of cases of malignant disease operative treatment may hasten rather than retard death. This statement seems to contradict the results of statistical investigation as laid down by such authorities as von Winiwarter and Gross, whose meritorious works are well known to all surgeons.

But this contradiction is partial only, and is justified by the nature of statistical results in general, which we know are arrived at by summing together cases widely different in character, though all representing the same disease.

Our critical attention will necessarily be first directed to the comparative estimates by averages of the duration of life of patients operated on for cancer of the breast and patients not subjected to operative treatment.

Here we see that Winiwarter finds the average duration of life from the beginning of the disease of the patients operated on to be about 39.5 months, whereas that of patients left to their fate is almost 33 months. The former, accordingly, live on an average about six months and a half longer than those not coming under the surgeon's knife.

On further examining the figures it will be remarked at once, that the number of observations of non-operated cases is very

<sup>1</sup> "*Deutsche Chirurgie; Krankheiten der Brustdrüsen*," p. 112.



small as justly compared with those operated on, one being 97, the other 519. Take into consideration, furthermore, that many, if not all, of the non-operated cases were subjected to all manner of irritative treatment, greatly influencing their rapid development and dissemination; finally, that many of them may have been such as show a formidable malignant character, deterring even the boldest operator, and it will be easy to comprehend that the rate of mortality as calculated for these 97 cases is unreliable and too high if applied to all cases of unoperated cancer, many of which, not being very malignant, did not come under operation at all. But let us analyze the class comprising those subjected to operation. Here we find that somewhat over *nine per cent.* of the cases were permanently cured by the operation. They necessarily must have been those in which a complete removal of all diseased tissues was successfully accomplished. It is of the utmost importance to note that such a thing is possible under certain most favorable conditions, offered by an early and very thorough operation upon a not extensive tumor of comparatively slow growth. Clinicians know and admit differences of infectiousness in cancers, which depend upon a more or less rapid growth, and accordingly upon a greater or less proportion of succulency attributable to more or less embryonic, non-fixed, or movable tissue components or corpuscular elements. Their anatomical expression is a greater or lesser proportion of *cancer juice*, as produced by scraping of their cut surface with a scalpel.

To go back to a former comparison, we may say that, as the corpuscular or liquid elements of a recent succulent inflammatory infiltration are more easily dispersed by massage, so will the elements of a succulent cancer be more prone to be dispersed by mechanical factors, and we may add that their rapidity of reproduction also stands in direct proportion to the ease with which they are dispersed. This relationship suggests resemblance to a geometrical progression, and may serve to explain the enormous differences of malignity observed in cases standing at the foot and at the head of the statistical scale respectively. Gross mentions a case that terminated fatally without operation at the expiration of five months. Bill-

roth gives the history of one in which the patient lived for twenty years.

To return to the cases cured permanently, we may say that a few of them may have been very malignant ones, operated upon very early and very radically, but that most of them were not very malignant and were subjected to a very radical operation; finally, that in all of them up to the patient's death from other diseases no formation of cancer, *de novo*, had taken place. (It is still a mooted question whether even a regional recurrence of cancer three or more years after operation is a continuation of the old process, or a new disease, *per se*.)

The large majority of the three hundred and sixty-eight cases operated upon, that is, nearly eighty-one per cent., showed recurrence. In eleven and a half per cent. of the three hundred and sixty-eight cases, recurrence took place after twelve months; but it does not appear in what manner or where. It would be important to find whether the general character of these recurrent tumors was mild or severe, local or general, and what was their microscopical nature (succulent or firm and dry).

Presumably these were mostly tumors of not great malignancy or of a slow growth, incompletely removed, yet so that very few cancerous elements were left behind to multiply.

It may be pertinent here to mention the curious fact, though no explanation of it is ventured, that seemingly infected glands have been seen to disappear after the removal of the primary tumor in such cases even where the knotty, hard nature of the glandular swelling fully justified the assumption of its cancerous character.

Within three months sixty-three per cent. of the cases relapsed, forty-three per cent. within *four weeks*, and nineteen per cent. even before the lapse of a *fortnight*.

In about eighty-two per cent. of one hundred and ninety-four cases of recurrent cancer where this point was noted, the locality of the relapse was in the cicatrix, in the remains of the mamma or in its vicinity, and in the glands.

These figures are appalling; they show that in almost two-thirds of all cases operated upon relapses are established within three months after the operation. Undoubtedly the

great majority of these cases represent very incomplete operations, where already disseminated portions of the neoplasm were left behind, either in the vicinity of the primary growth or in or about infected lymphatic vessels and glands. The cases relapsing within four weeks (43 per cent.), and still more so those recurring within a fortnight (19 per cent.), must be those in which either grossly incomplete operations were performed, or artificial operative dissemination took place, or finally where both of these occurrences combined to cause a rapid involvement of hitherto seemingly healthy tissues. We have to add, finally, while treating of this group, a class of cases characterized by Billroth in the following words: "Cases operated on under seemingly very favorable circumstances—in which, however, the patients are already victims of internal carcinosis, this becoming evident on post-mortem examination made soon after the operation—are, unfortunately, *not very rare*."<sup>1</sup>

Of course the occurrence of such cases can not be gainsaid, but, considering the gradual extension of cancer observed as a rule, such an infection by a jump, as it were, must nearly always be caused by mechanical factors. By these are meant either a build and arrangement of the lymphatics unusually favorable for the easy transmission of corpuscular elements, or a very energetic and effective external agency, such as a traumatism, or massage, or long-continued compression, or all of these combined.

But, to return to our subject, we will say that von Winiwarter does not state whether a change in the character of the malignancy of these neoplasms was observed or not on their recurrence after operation. And herein all observations are strangely defective, and unfortunately so, as this seems to constitute the nodal point of our inquiry. If it were shown that in a certain number of tumors of previously slow growth a fast and extensive *local* recurrence took place immediately after a comprehensive and thorough-going operation, performed by a competent and experienced surgeon, it would be necessary to assume the concurrence of a factor hitherto unknown, even unthought of. And if the marginal portions of the removed

<sup>1</sup> *Loc. cit.*, p. 117.

tissues were found, on careful and exhaustive examination, to be entirely free from such miliary foci of cancer as can be detected by the microscope, the presumption of a direct influence upon the nature and course of the disease by the operation would be almost imperative.

Older surgical writers directly admit the possibility of such an influence; modern authors, as, for instance, Billroth and Volkmann, only by inference; and their reticence in this respect is easily explained by the lack of a sufficiently large sum of observations collected with a view to the ascertainment of this very point, and by the necessity of questioning the correctness of the generally accepted assumption that the operated cases show a much longer average duration of life than those let alone.

Let us now examine what this peculiar "influence" of operative or other mechanical irritation upon a cancerous growth may consist in. Excluding chemical irritation, and considering only forms of irritation looked upon as more strictly mechanical and akin to massage, we find that this influence may be twofold. On the one hand, it may induce active hyperæmia, a better nutrition of the tumor, and hence a more rapid multiplication of existing elements *in situ*. On the other hand, and following from the first, it will increase the activity of the lymphatics, and fitly prepare them for the reception and transmission of mobile cancerous elements. Finally, the changing degrees of pressure from different sides, and its intermittent character will not fail in suitable cases to propel such cancerous elements to a shorter or longer distance; and, if the form of mechanical irritation is constant or frequent, a large area of the surrounding tissues may become injected with cancerous elements in a comparatively short time. Supposing that all this takes place during an operation, followed by unavoidable stimulation of the tissues thus infected incumbent upon the processes of repair, what wonder if we see a large number of small nodes appear in and about the cicatrix left after the removal of a solitary tumor, and within a few weeks after the operation?

Instead of assuming a mysterious, indefinable change in the character in the new growth, it is more rational to explain a

natural process by natural and well-known biological laws. It may be objected that all operations followed by a rapid and wide-spread reappearance of the disease about the sites operated on must be those in which pre-existing foci of cancer were unwittingly left behind by the operator. Admitting, as we have done before, that a large number of cases are covered by this explanation, yet we may reply to this with the following question: What is the reason, then, of the simultaneous appearance and rapid growth of a large number of cutaneous foci shortly after the operation on a formerly slowly growing tumor? Why do these foci remain dormant, or grow imperceptibly until the time of the operation, and suddenly come forward in an unmistakable manner after the traumatism of an operation? And there is not only a spread, there is frequently also an increased rapidity of the multiplication of the elements, an increased malignity denoted as a *change of character*. And why this? Our explanation seems to cover these questions.

Besides, it is not impossible that young cancerous cells, sown, as it were, in new soil, well prepared by an increased blood-supply due to the healing process, will thrive much better in this unexhausted, well-irrigated ground than elsewhere.

Of course all this does not prejudice the acceptance of the fact that positively benign tumors do change occasionally into malignant ones, but it seems that this important mechanical factor in the growth and dissemination of cancer ought to receive some recognition.

The author has begun a series of experiments tending to prove the possibility of mechanical or surgical dissemination. But the results of the investigation of the subject have not matured yet for publication. Before completing this paper it may be appropriate to point out in a few words its practical bearings.

It is not intended to question the general correctness of the advisability of operating even in far-gone cases of cancer. On the contrary, it is hoped that by pointing out one more danger we may be taught to avoid this also, and thereby the results of operative measures in this field may become better. Antisep-

tic treatment has here, too, undoubtedly stimulated active surgical interference, and, though the author's material includes only thirty-four cases of malignant tumors of the breast operated upon radically—that is, in which the breast and the axillary contents were removed, and six partial operations, with no deaths resulting from the operations—this may justify the conclusion that antiseptic measures must have generally depressed the death-rate of 16.5 per cent., as given by Winikwarter.

Nothing need be said about the necessity of early operations, and the very radical, extensive removal of a wide zone of seemingly healthy tissues surrounding a cancrroidal tumor. If the neoplasm is on an extremity and is extensive, the preference should be given to an amputation done far away from the disease. Wölfler has conclusively shown on animals that, during the time that Esmarch's constriction is applied to a limb, the veins and lymphatics beyond the constricting band are inactive, and do not absorb even soluble substances, and that these do not enter the ostia of the vessels opened by the surgeon's knife as long as the constriction lasts.<sup>1</sup> It seems to be rational, then, to always employ Esmarch's constriction while excising malignant tumors situated on a limb, since it is improbable that corpuscular elements would be propelled where there is no medium, such as blood or lymph, to carry them along. In examining any kind of tumor, the utmost gentleness should be observed, and obscure points in the diagnosis not bearing upon the therapy should rather be left undecided till after the operation. Unnecessary handling of a suspicious tumor should be discouraged, and the patients especially warned against so-called abortive methods of treatment, as painting with irritating chemicals, and especially the several forms of compression, constant or interrupted.

As a preparatory measure, the hyperæmia and cell-activity of a rapidly growing tumor should be reduced as much as possible by the constant application of ice, or the water coil, for several days preceding the operation, as it is notorious that the growth of some tumors has been noticeably retarded by the influence of low temperatures.

<sup>1</sup> *Archiv. für klin. Chirurgie*, 27 Band, p. 413.

During the exsection of deeply imbedded tumors all rough handling, pulling to and fro, should be avoided as much as possible. This may be very difficult in cases of large, heavy tumors, or where it is necessary to work in a deep, non-dilatable wound, wherefore the proposal of an English surgeon to fasten into each tumor, after its exposure, a sharp hook attached by rope and pulley to the ceiling of the operating-room, seems to be very appropriate. One assistant can easily raise or lower even a very large tumor by traction applied to the rope running through the pulley, while the surgeon himself, holding the shank of the hook, can carry out without fatigue such lateral movements as become necessary in the course of the operation. This would deserve a trial, especially in amputations of the female breast. For self-evident reasons the axillary fat should be invariably removed, and in one mass, this being much easier and safer than the digging out of single glands. The operation should be begun, if possible, with the evacuation of the axillary space, and its contents, together with the breast and the intervening tissues, should be removed in one piece.

Primary union of the entire operation wound should be always aimed at where possible, since suppurative processes and the increased reproductive activity of the tissues depending thereon tend to cause an early development of such cancerous elements as may have been left behind.

The view that non-destructive suppuration may eliminate such cancerous elements has no support in pathology. The surgeon should rather use his knife freely than invoke the aid of such a treacherous ally as suppuration.

# THE FIELD AND LIMITATION OF THE OPERATIVE SURGERY OF THE HUMAN BRAIN.

[Continued from p. 22.]

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IX. The results of the study of cerebral localization are more necessary to the conscientious surgeon than to the neurologist.

If any of the cerebral functions are with certainty recognized as located in definite convolutions and regions of the cortex of the cerebral hemispheres; if it has been demonstrated that perforation of the skull and incision of the membranes and brain will at times prevent the destruction of life by intra-cranial inflammation, abscess or tumor; then it follows as a direct conclusion that a man, who assumes the role of a specialist competent to relieve disease by operative measures when medicinal therapeutics become impotent, must, if he is conscientious, make the subject of cerebral localization an object of study. I hold that such study is more necessary to him than to the neurologist, though the latter may, and probably does, need a more detailed knowledge of the subject. The surgeon, when called upon to decide as to the propriety of operation, is often, and indeed usually, the sole authority by whom the question must be determined. If operation is required in these cases, it is required at once; no time can be wasted in waiting for the services of a neurologist living in a distant part of the county or state. Often, moreover, time to consult books is scarcely available. Therefore, as many cerebral functions *have* been definitely localized and many cases *have* shown that life can be saved by perforation of the skull and incision of the membranes and



brain, I hold that the study of cerebral localization *is* more important to the conscientious surgeon than to the neurologist, who is seldom called upon to determine such questions in haste, except when the surgeon finds his own knowledge deficient.

Reference to a few of the cases in which cerebral localization or functional cerebral topography has been well utilized in surgical practice is here proper. Afterwards, I shall detail some of the facts which experimental and clinical investigation have proved to be of value to surgeons.

The recent removal by Godlee of a gliomatous tumor of the size of a walnut from beneath the gray matter of the upper part of the ascending frontal convolution has probably attracted the notice of you all.<sup>1</sup>

The patient died, after the expiration of four weeks, from meningitis, which it is possible may have been due to inefficient drainage of the wound, as I have seen no statement that drainage was provided. The chief symptoms which led Dr. Hughes Bennett, who had charge of the case, to diagnose the extent and locality of the tumor were paroxysmal twitchings of the left side of the face, alternating with twitchings of the left hand and arm followed by slowly progressive paralysis of the hand, and later by twitchings of the left leg and eyelid and paresis of the left leg. These symptoms were accompanied by double optic neuritis and violent headache. Dr. Bennett concluded that there was a brain tumor involving the cortical substance of the right hemisphere; that it was probably of limited size, as it had destroyed the centres presiding over motion of the hand, but had not yet destroyed the centres of the leg, face and eyelids; and that to reach it trephining should be done at the upper third of the fissure of Rolando. The operation was performed and the tumor readily removed. The lancinating pains in the head, the vomiting, the twitchings of the limbs, were relieved: up to the 20th day, the temperature was never over 100°, the pulse not above 90, and the patient was perfectly intelligent. Death, however,

<sup>1</sup> *Lancet*, December 20, 1884, and January, 1885. See also *Annals of Surgery*, St. Louis, March 1885, for Dr. Amidon's review of the case.

occurred on the 28th day after rigor; fever and pain had occurred during several days preceding.

It has been stated<sup>1</sup> that Macewen, of Glasgow, has twice successfully removed foreign growths of which the site had been determined by the principles of cerebral localization. Other successful operations for localized purulent and hemorrhagic exudations similarly detected have been attributed to the same surgeon. He recently wrote me that he had not yet put the records of his cases in print, and that the accounts which had already appeared of some of them were not very trustworthy, but that he shortly intended to publish all of his cases bearing on this point. We are still, therefore, without any authoritative statement of the details of his operations. Broca, Lucas-Championnière, E. C. Seguin<sup>2</sup> and E. C. Fuller<sup>3</sup> have given careful attention to, and valuable clinical information upon, the subject of cerebral topography in its surgical relations.

Dr. M. Allen Starr has given<sup>4</sup> a valuable analysis of American cases in which there existed localized cortical lesions of the brain. Some of these cases are surgical, others medical, but the two papers deserve the careful perusal of every surgeon.

The following case of operation from the unpublished notes of Dr. Charles K. Mills, and furnished by his resident physician, shows very distinctly the value of cerebral localization.

*Epilepsy following cranial traumatism: Situation of meningeal lesions diagnosed by the principles of cerebral localization: Trephining: Death.*

A man, aged about 40 years, without any personal venereal history, and belonging to a family without any epileptic history, had, it was said, excellent health until eleven years before he came under Dr Mills's observation. At that time, in 1873, he was struck upon the head many times with a boot-jack, and the mother was told by a physician that the skull was crushed through the skin was not lacerated. Consciousness was not lost at the time of the injury. Great swelling

<sup>1</sup> *Boston Med. and Surg. Jour.*, January 15, 1885.

<sup>2</sup> *Archives of Medicine*, December, 1882.

<sup>3</sup> *Archives of Medicine*, Vol. IX., p. 262, 1884.

<sup>4</sup> *Amer. Jour. Med. Sciences*, April and July, 1884.

of the parts followed immediately, and there occurred intense headache, which was almost constant, though much worse at times than at others. This was soon succeeded by attacks of vertigo, which sometimes resulted in his falling to the ground; consciousness, however, was retained. These attacks increased in severity until about three years after the receipt of injury, when he first began to suffer with true epileptic paroxysms, chiefly petit mal. The convulsions were slight or wanting, and unconsciousness lasted only a short time. The mother states that once a month he would have from three to six fits, after which he would be exempt from them until the next change of the moon.

The seizures gradually increased in severity and number during the eight years following his first paroxysm. During all these years he suffered with headache, which was always located at the seat of injury, which at times was so intense as to cause him to throw his hand to the seat of pain, and run and bury his head in his mother's lap.

About the time he first began to lose consciousness during the attacks (three years after injury) his eyesight rapidly began to fail, and he entered the Wills Eye Hospital, where he remained a short time. Previous to his death he was only able to see the name of the paper on a newspaper, and partly on this account, as well as on account of his headache, he seldom went out unattended by his mother. During the past weeks he appears to have suffered more than usual from his headache, which was described as a throbbing at the seat of the former injury, and his epileptic paroxysms came on him more frequently and were of a more convulsive character. His mother states that he would never bite his tongue during the convulsion, but that there would be some frothing at his mouth, and that his jaws would be fixed.

Five or six days before entering the Philadelphia hospital, he first noticed a weakness of the right arm, and a little later of the leg on the same side (the seat of injury being the left). About two days later he was unable to raise his arm, and in walking dragged his right leg. His mother does not know whether there was a disturbance of sensibility on the affected side or not.

His mother states that the convulsions followed each other at intervals of about half an hour, and that between them his mental condition had been the same as it was when Dr. Free, resident physician, found him on arriving in the ambulance. He was at that time lying on the floor, almost nude, in a maniacal condition, constantly repeating "I did not do it," all the while throwing his left hand up over the left side of his head, and then again down to his side or over his abdomen. His right arm and leg he did not move. The jolting of the ambulance seemed to promote his paroxysms, as he would have them every five minutes.

On arriving at the hospital he was given 80 grs. of bromide of potassium, but with no effect. Nitrite of amyl was tried, but was found equally useless. Then inhalation of ether during the paroxysms, with hypodermic injections of morphia and atropia were administered, which shortened the attacks. During the convulsion the left arm was in a state of rigidity and the fingers clinched. There was also marked clonic spasm of the arm and leg of the right side, alternating with some rigidity. The spasm in the right side differed from that in the left in being both clonic and tonic. The eyes were fixed, deviating to the right side, and the pupils very much dilated, the left slightly more so than the right; especially was the latter fact noticeable between the paroxysms. In the intervals his eyes showed a beautiful example of horizontal oscillation. This was bilateral, and the eyes acted together with perhaps a slight internal strabismus. Pulse very irregular, ranging from 100 to 160. His convulsions during the night followed each other at regular intervals of from 13 to 15 minutes, and if they were anticipated by inhalation of ether would be postponed until the end of the next 15 minutes.

About midnight he began to use his arms less wildly, his paroxysms occurred at longer intervals, and his pupils, which before had been widely dilated, contracted almost to pin head size, but dilated during the paroxysms. Respiration was impeded or almost arrested after the convulsions, but never became stertorous. He passed very little urine. He became comatose, and remained so until June 5th, 5 P. M.

At this time the patient was first seen by Dr. Mills, and in consultation with Dr. Hearn it was decided to trephine. Although the mother stated that the injury was on the left side of the head, well forward, it was not indicated by any scar; but Drs. Mills and Hearn decided to trephine on the left, about the Rolandic line, concluding that the convulsions on the left were due to involvement of the dura mater, while those in the right to cortical irritation of left hemisphere, in addition to the dural spasms.

The operation was done without the aid of an anæsthetic, and a piece of the skull removed. The dura mater was found rather more injected than was normal, and slightly adherent to the portion removed. No depression or fracture of the internal table was apparent. Soon after the operation he became quieter, his convulsions less marked, and he was again able to swallow and take a little nourishment during the night.

On the morning after the operation he spoke a few words intelligibly, and recognized his mother.

Nourishment was given him both by stomach and rectum, as he

could retain but little in his stomach. His convulsions during the day and night were slight, and involved both sides. June 7th and 8th, second and third days after operation, it was evident that the man was becoming weaker, his pulse more feeble and rapid, but his temperature not much above normal; his breathing was hurried, but not stertorous, and he slept a considerable portion of the time. On the second day he had about six convulsions and but four on the third. On the night of June 8, 80 hours after the operation and four days and a half after beginning of his attack the man died without a struggle, having had no convulsion during the night.

Autopsy held 13 $\frac{3}{4}$  hours after death.

Scalp wound the result of trephining, which had been performed June 6, 1884.

On the left side, at the seat of operation, the dura mater of convexity of left hemisphere, at a point one-fourth inch in front of fissure of Rolando and forward, was firmly adherent to pia mater and substance of the brain. The tissues as a whole formed a common mass. The dura mater was adherent to the skull over the anterior portion of this area, and was also very firmly adherent at base on left side under the middle lobe.

The trephining had been over the seat of meningitis. The dura mater was much detached, particularly over the anterior frontal lobe, and adhered beneath to the gray and white matter.

Membranes showed necrobiotic spots.

Cause of death, pachymeningitis.

Although this dying man's life was not saved by operation, the seat of disease was determined by the symptoms, which was an important matter, since no scalp lesion or accurate clinical history pointed to the exact region of injury. Dr. Mills looks upon the case as one of meningeal disease induced by an injury, causing sub-cranial extravasation without fracture, which resulted in secondary meningitis, leading to adhesion. It is given here as an example of the value of localizing symptoms.

Enough is shown by these cases to prove the distinct surgical value of the study of cerebral localization, despite the opinion of one of our most distinguished members, who in 1882, after speaking of the investigations of Broca and Lucas-Championnière, said: "I hope that I may be pardoned for



tal. Ranney<sup>1</sup> says the line or plane is easiest drawn in the living subject from the cusps of the teeth to the tip of the mastoid process. This alveolo-condyloid line is the base line from which other measurements are made. A perpendicular line drawn upwards from the alveolo-condyloid line through the external auditory meatus corresponds at the top of the skull with the transverse plane running through the bregma or point of intersection of the sagittal and coronal sutures. This line is called the auriculo-bregmatic line. The location of the bregma which, of course, lies in the median line of the head is thus determined.

Sometimes the bregma, which is the anterior fontanelle of infancy, can be felt through the scalp of adults; if it can not be so distinguished the ready methods of Broca or Lucas-Championnière may be employed instead of the mathematical one just described. A draughtsman's square of flexible material, such as steel, copper, or tin, which has at the intersection of the arms a conical plug to go into the auditory meatus, may be used. The plug is to be placed in the ear, the horizontal arm bent until it lies across the upper lip, directly under the columella of the nose, and the vertical arm then bent over the top of the head. The bregma is at the point where the axis of this vertical arm crosses the median line of the skull. This will probably give the situation of the bregma more accurately than the original Broca square, which, according to Lucas-Championnière,<sup>2</sup> had the ear-plug a little behind the intersection of the arms. The other method of locating the bregma is to cut a section out of a sheet of pasteboard so that it will sit astride of the shaven head from auditory meatus to auditory meatus. In order to insure the pasteboard being perpendicular to the alveolo-condyloid line, a lead pencil or stick is thrust at right angles through the pasteboard on a level with the eyes. This enables the surgeon to detect any error in the horizontal position of the base line of the head. The centre of the arch in the card-board is over the bregma.

The fissure of Rolando of each cerebral hemisphere, which is the most important cerebral sulcus concerned in

<sup>1</sup> *Applied Anatomy of the Nervous System*, p. 69.

<sup>2</sup> *Trépanation Guidée par les Localisations Cérébrales*, p. 112.

our present studies, has its upper end about 5 centimetres behind the bregma, but does not run quite up to the middle line. Some writers give 4.5 centimetres, others 5.5 centimetres. Its lower end lies about 0.5 centimetre behind the auriculo-bregmatic line and a little above a horizontal line, parallel to the alveolo-condyloid line, carried backwards from the superciliary ridge. This would place the lower end of Rolando's fissure about 6 centimetres above and a little behind the external auditory canal. Another method

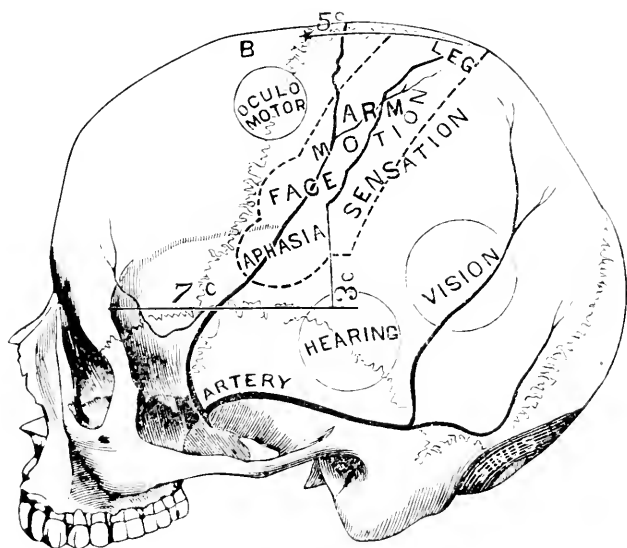


FIG. II. DIAGRAM OF THE EXTERIOR OF THE SKULL.

Upon this have been indicated the measurements for determining the position of the fissure of Rolando; and the location of the regions under which lie the centres of motion and sensation, as well as those of vision and hearing, and the oculo-motor centre. The position of the grooves for the two branches of the middle meningeal artery and for the lateral sinus are also shown.

of fixing the lower end of the fissure of Rolando is to draw a horizontal line, that is a line parallel to the alveolo-condyloid line, from the external angular process of the frontal bone, where it begins to curve upwards to form the temporal ridge. At a point 7 centimetres distant from the anterior extremity of



this line draw a perpendicular line extending upwards 3 centimetres. The end of this last line is over the lower end of the fissure of Rolando.

Erichsen quotes Thane<sup>1</sup> as follows: "The upper end of the sulcus of Rolando is placed about half an inch behind a point midway between the root of the nose and the external occipital protuberance, its lower end is close to the posterior limb

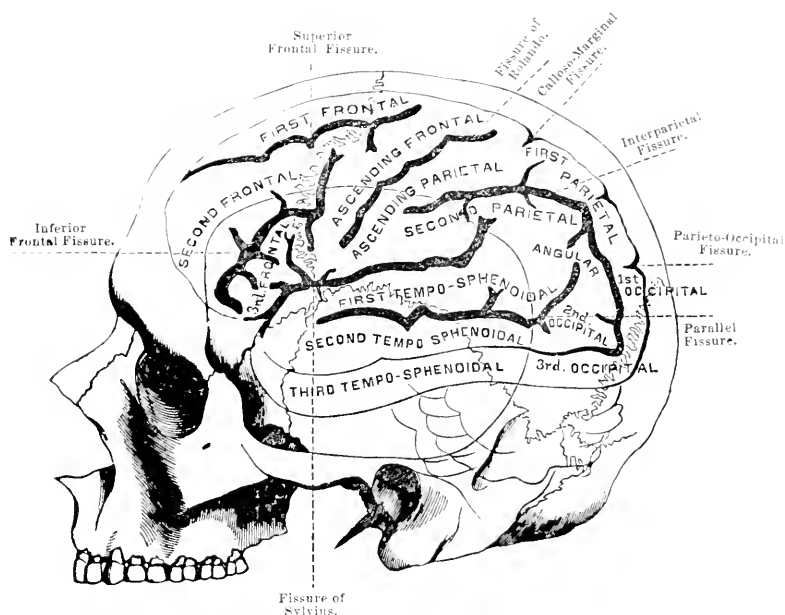


FIG. III. THE CHIEF CONVOLUTIONS AND FISSURES ON THE EXTERIOR OF THE CEREBRUM, (DIAGRAMMATIC).

and about an inch behind the bifurcation of the fissure of Sylvius. The bifurcation of the fissure of Sylvius corresponds to a point one inch and a quarter behind and a quarter of an inch above the level of the external angular process of the frontal bone."

The occipito-parietal fissure corresponds nearly with the lambdoidal suture at the median line.

After the location of the fissure of Rolando has been

<sup>1</sup> "Science and Art of Surgery. I., p. 731.

marked, as with an aniline pencil, on the scalp, it is easy to locate the cerebral convolutions which control the movements of the opposite half of the head, body and limbs.

"The first or superior frontal convolution will be found commencing about 2.5 centimetres behind the bregma, and passing forward near the median line toward the orbit. The second frontal convolution will occupy a similar but more lateral position, while the third frontal convolution lies wholly in front of the auriculo-bregmatic line and on a plane 5 centimetres above the external auditory meatus. Its folded or central part is about 2.5 centimetres in front of the auriculo-bregmatic line, or about 2 centimetres behind the external angular process of the frontal bone."<sup>1</sup>

I have now shown how we can outline upon the scalp the situation of the cerebral convolutions. Hence, if we find symptoms which are known to be produced by lesions of certain regions of the cortex of the brain, it becomes our duty to trephine over the region indicated, provided that the symptoms are sufficiently particularized to indicate that a moderate, I do not say small, area of the brain is affected by disease. Inflammation, abscess or tumor, while circumscribed, will give a localized group of symptoms; soon, however, secondary œdema, inflammation, or softening may occur, and by affecting other areas of the brain will give additional symptoms. These secondary or indirect local symptoms will render accurate delineation of the seat of lesion difficult. Cases therefore should be studied accurately and carefully by competent observers at an early period, before the symptoms became more general, through advancing disease, and the relief possibly derivable from operation diminished.

Cerebral localization is as valuable when informing us to abstain from operation, as when telling us that speedy operation is demanded. Loss of motion, or motor paralysis, is the symptom that has been chiefly depended upon as a localizing symptom in surgery; because it is more easily observed and has been more carefully studied than loss of sensation, or sensory paralysis, and the other cerebral functions. The area about the fissure of Rolando is that in which the motor cen-

<sup>1</sup> Amidon, *Medical News*, June 21, 1884.

tres for the face and limbs have been found by physiologists and neurologists. It is necessary, therefore, to study these in more detail. As physiological knowledge increases the sensory area of the brain will, in all probability, become equally important to surgeons.

I have formulated the most important facts, according to recent physiological research, in order that the bearing of the corresponding surgical questions may be understood. The progress of knowledge may overthrow some of my conclusions, but that they are quite justified by present knowledge I think undoubted. The physiological portion and the tables which immediately follow have been submitted to my colleague, Dr. Chas. K. Mills, who, while not responsible for my statements, has kindly given me valuable suggestions. In order to use these facts a general diagnosis of a cortical lesion, that is, of a lesion not of the ganglia or tracts, must first be made.

*Motion.* The gray matter of the ascending frontal and ascending parietal convolutions, which are separated from each other by the fissure of Rolando and which coalesce over the top of this fissure in the paracentral lobule, is the portion in which are chiefly located the motor centres of the muscles of the face, tongue, arm, and leg, of the opposite side of the body, although the motor zone may extend forwards or backwards slightly beyond the strict limits of these convolutions. Some few nerve fibres are in relation with the muscles of the same side, but nevertheless in fully 90 per cent. of lesions of the cortical centres the anomalies of motion, namely, spasm and paralysis, occur on the side opposite to that in which the brain lesion exists. This statement is subject to modifications to be presented when speaking of the role of the dura mater. These ascending convolutions are conveniently spoken of as the central region.

The motor area for *face* and *tongue* lies in central region *lower 3d*; for the *arm*, central region, *middle 3d*; for the *leg*, central region, *upper 3d*.

In these areas are the centres for the individual muscles of said limbs, face, and tongue.

Spasm of one of these groups of muscles indicates irritation of the corresponding motor area in the brain cortex.

Paralysis of the same group of muscles indicates destruction of the same motor area.

Spasm or paralysis of two of these groups indicates that the lesion involves more than one area; for example:—Paralysis of one side of the face and of the corresponding arm indicates a destructive lesion of the lower and middle thirds of the central region; paralysis of the arm and corresponding lower limb points to a destructive lesion of the middle and upper thirds of the central region. Spasm would indicate similarly located irritative lesions.

Paralysis of face, arm, or leg (hemiplegia), would indicate destructive lesion of the lower, middle and upper thirds of the central region, and spasm of the same muscles, irritative lesion of all three portions of the central regions, except that it must be remembered that a primary lesion of one area sometimes affects secondarily the neighboring area or areas and causes hemiplegia. This is explained by several facts, among which are these:

The blood supply to the central region comes entirely from the middle cerebral artery which ascends in the pia mater upon the surface of the convolutions from the base in the vicinity of the island of Reil. Hence a lesion in a lower area may cause secondary symptoms in the area or areas above by cutting off its arterial supply.

The nerve fibres converge as they pass inwards from the cortex to make up the bundles traversing the interior of the brain in their journey to the muscles. Hence a lesion whose influence extends, by pressure or otherwise, below the surface a short distance, may implicate converging fibres coming from surrounding cortical areas, and thus give results such as would occur if these more distant cortical areas were really involved.

These and other facts explain the occurrence in some cases of hemispasm or hemiplegia, or of extensive spasm or extensive paralysis from limited lesions. If the lesion be a small focus of disease, thus giving rise to extensive spasm or paralysis it usually will first cause symptoms in the group of muscles supplied from the small area primarily affected, or the symptoms in that group will be more marked than in those secondarily

involved. This point is of diagnostic importance. Hence the relative time of occurrence of symptoms always demands careful investigation.

When monospasm or hemispasm is one of the consensus of symptoms, the seat of the primary lesion may often be determined by study of the character of that spasm; especially by attention to the special muscles in which the spasm began. It is likely to be in that part of the cortex which is the area of control for this special group of muscles.

Paralysis of groups of muscles following spasm of the same, is characteristic of disease of the central region.

Seguin suggests that a hemiplegic state may be discovered, at least in some cases, by an increase of peripheral temperature, as of fingers or toes, on one side, or by the presence of congestion or erythema on one buttock.<sup>1</sup>

This may be valuable in diagnosing cerebral hemorrhage from alcoholic coma and similar affections.

*Sensation.*—Late observation and experiment have proved that disturbance of general sensation, also, is one of the direct local symptoms of lesions in the central region. These disturbances include the senses of touch, pressure, pain and temperature, and the sense of location of a limb; and may consist in impairment of these functions or the perception of such sensations when there is no objective cause to produce them (hallucinations of sense).

General sensation then, is located in the central region, and especially it would seem in the portion behind the fissure of Rolando, that is, the ascending parietal convolution. It must not be forgotten, however, that the sensory region seems to include also the parietal lobes which lie behind the ascending parietal convolution, and which, it will be observed, contain but few motor centres and fibres.

The motor and sensory regions thus seem to overlap; for lesions in front of the fissure of Rolando have caused sensory, as well as the usual motor disturbances, and we have seen that motor disturbances may be due to lesion behind the fissure of Rolando in the ascending parietal convolution, where I have just said sensory areas exist. It is possible that future and

<sup>1</sup> *Gross, System of Surgery*, Vol. II. p. 44.

more accurate investigation will show that the motor region is particularly located in front of the fissure of Rolando, but extends on the posterior side of the fissure, overlapping, or fading, into the sensory region behind the fissure, in a manner similar to that in which the motor areas for the arm and leg appear to overlap or fade into each other. It is more probable, perhaps, that we have not yet sufficiently defined the exact boundaries, because our methods of investigation are not sufficiently accurate. As is the case with the motor centres, which are connected especially with the opposite side of the body, so is it with the sensory centres; though a few sensory fibres go, as do a few motor fibres, to the same side of the body. Hence, sensory lesions give more marked sensory disturbance on the side opposite the lesion, and effect in a less degree the side corresponding to the lesion.

The sensory area for the <i>face</i> probably	} and probably be-
lies in the central region <i>lower</i> third.	
The sensory area for the <i>arm</i> probably	
lies in the central region <i>middle</i> third.	} of Rolando in the
The sensory area for the <i>leg</i> probably	
lies in the central region <i>upper</i> third.	} ascending parietal and parietal convolutions.

Hyperæsthesia, pain, or paræsthesia of the face, arm or leg indicates irritation of the corresponding sensory area in the brain cortex.

Anæsthesia and analgesia indicates destruction of the corresponding sensory area in the brain cortex.

Hyperæsthesia or anæsthesia of two cutaneous tracts indicates that the lesion involves more than one area; for example: Anæsthesia of one side of the face and of the corresponding arm indicates a destructive lesion of the lower and middle third of the central region, probably situated behind the fissure of Rolando, and also in the parietal convolutions. Anæsthesia of the arm and corresponding lower limb, points to a destructive lesion of the middle and upper third of the central region, probably situated behind the fissure of Rolando, and also in the parietal convolutions. Hyperæsthesia would indicate similarly located irritative lesions.

Anæsthesia of face, arm and leg (hemianæsthesia) would indicate destructive lesion of the lower, middle and upper thirds

of the central region, probably situated behind the fissure of Rolando and in the parietal convolutions; and hyperæsthesia of the same cutaneous tracts, irritative lesion of all three portions of the central region, probably situated behind the fissure of Rolando and in the parietal convolutions.

If motor paralysis is associated with these sensory disturbances in a cortical lesion, the probability is that we have a lesion involving both the ascending and the parietal convolutions. If the motor paralysis is slight, the lesion probably predominates in the parietal lobule.

*Loss of the Special Senses.* In localizing brain lesions by impairment of the special senses, it is important to eliminate all lesions occurring between the cortical centre and the sense organ. For example, loss of sight in brain disease may be due to an increase of intra-cranial pressure from a tumor causing choked disk, or loss of smell to pressure of a growth on the olfactory nerves after they leave the base of the brain. Such sources of error must be eliminated. This often requires careful study of the case.

Hemianopia, failure to recognize or remember familiar objects, or hallucinations of vision indicate disease probably in the occipital lobes, not far from the angular convolution. If the failure of sight includes the whole field of vision, both hemispheres are involved; if hemianopia only is present, one hemisphere is involved. Blindness of the right half of both eyes, that is, obliteration of the right half of the field of vision, indicates destructive lesion of the left occipital lobe, though it is the *left* half of the retina which is impaired. Hemianopia on the left side means lesion of the right side of the brain.

Deafness in one ear, or hallucinations of hearing on one side (such as voices and music), indicate disease of the first temporo-sphenoidal convolution of the opposite side. Failure to recognize or remember spoken language indicates lesion of the left first temporo-sphenoidal convolution in right-handed persons and of the right first temporo-sphenoidal convolution in left-handed persons.

Loss or hallucination of smell possibly indicates disease at the base of the brain in the temporo-sphenoidal region, which could not readily be reached by surgical procedures.

Loss of taste has not been sufficiently studied to afford even the suggestive evidence that we possess about disturbances of smell.

*Disturbances of other conscious mental actions*, such as judgment, reason and self control, will be exhibited in changed disposition and character of the patient. Such change, if no other general or localizing symptoms exist, indicates disease of the frontal lobes.

*Aphasia.* Disturbance in speech power, indicates disease in the neighborhood of the fissure of Sylvius, on the left side in right-handed persons, on the right side in left-handed persons. It must be recollected that neurologists distinguish three kinds of aphasia. Aphasia may be due to loss of—

- |  |   |   |
|--|---|---|
| 1. Memory of words (sensory aphasia).  | { | Whose centre is situated in the first temporo-sphenoidal convolution.   |
| 2. Memory of voluntary acts necessary to speech (motor aphasia).   |   | Whose centre is situated in the posterior part of the third frontal convolution and lower part of central region (ascending frontal convolution.) |
| 3. Connection between the regions just described, which is required to turn thought into speech (aphasia of incoördination). | } | This function is located in fibres passing through island of Reil.  |

There is some difference of opinion between French and German writers as to the distribution of these centres, but for our surgical purposes the assertions above given are sufficiently accurate. It will be seen that the convolutions mentioned are in close anatomical relation. I have followed, on this point and in many other respects, the elaborate resumé of Dr. Starr, who has analyzed a large number of reported American cases.<sup>1</sup>

If the patient understands a question, and can recall the words for a reply, but cannot make the requisite speech movements, he has motor aphasia, which indicates disease in the

<sup>1</sup> Cortical Lesions of the Brain, by M. Allen Starr, *American Journal Medical Sciences*, April and July, 1884.



third frontal and lower end of the ascending frontal convolutions.

If he cannot recognize spoken language, but is able to repeat words after another person, or can use exclamations on being annoyed, he has sensory aphasia, which indicates disease in the first temporo-sphenoidal convolution.

If he can understand and talk, but puts an unexpected word for the one desired, he has aphasia of incoördination, which

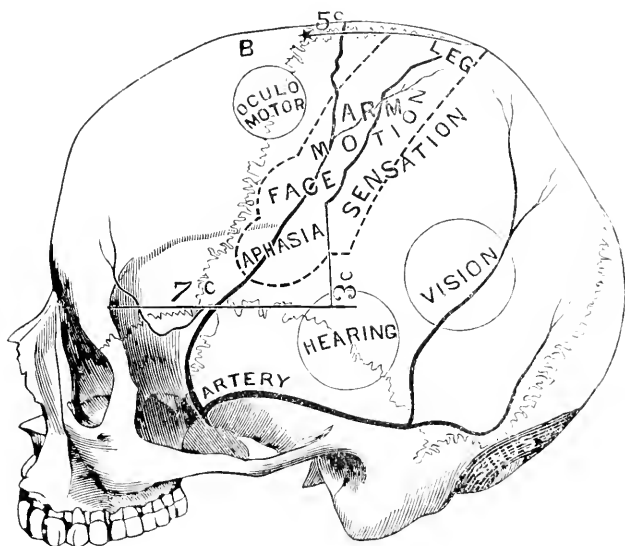


FIG. II. DIAGRAM OF THE EXTERIOR OF THE SKULL.

Upon this have been indicated the measurements for determining the position of the fissure of Rolando; and the location of the regions under which lie the centres of motion and sensation, as well as those of vision and hearing, and the oculo-motor centre. The position of the grooves for the two branches of the middle meningeal artery and for the lateral sinus are also shown.

indicates disease situated deeply within the Sylvian fissure or in the island of Riel and the white substance thereabouts, and involves the association fibres.

These points need further study, I admit, because all authorities do not exactly concur in these locations; but the difference is not enough to disturb the question of operation. When opening the skull, in the search for abscess or tumor located

by localizing symptoms, the surgeon should use a large trephine, because the exact spot of lesion is not determinable.

From a study of the points just discussed, and the writings of Lucas-Championnière<sup>1</sup> and A. L. Ranney,<sup>2</sup> I present the following deductions concerning the proper points for operation when lesions amenable to operative treatment have been distinguished and localized by the symptoms exhibited. It must be remembered, however, that I am treading very often on debatable ground, and have made statements which from increase in knowledge may require modification in a few weeks or months. I have endeavored to be categorical, and at the same time to indicate by my phraseology those opinions and logical positions which are most satisfactorily and certainly proved to be correct.

The researches of H. Duret,<sup>3</sup> who has shown that some motor symptoms may be due to traumatic irritation of the dura mater, must not be forgotten in studying individual cases. The non-correspondence of the symptoms, observed in a given case, with the typical symptoms described as accompanying a lesion in that locality, may be due to a dural lesion, in addition to the cortical lesion; and on the other hand, certain observed symptoms may be caused by dural, rather than cortical lesions. These questions are too intricate to be further discussed at this time, but must be indicated by me, in order that I may not deceive you into believing that cerebral localization is an easy problem in all cases of brain injury or surgical disease.

Duret says the dura mater contains sensory nerves eminently excitable, and that

"I. Irritative lesions of these nerves cause,

"1. Pain, hyperæsthesia, neuralgia and reflex motor phenomena.

"2. Reflex spasms or contractures of the muscles of animal and organic life.

"(a) The spasms or contractures of the muscles of animal life may occur in the face, eye-balls, neck, trunk or limbs. They occur sometimes on one side, sometimes on the other."

<sup>1</sup> *Trepanation Guidée par les Localisations Cérébrales.*

<sup>2</sup> *Applied Anatomy of the Nervous System.*

<sup>3</sup> On the Role of the Dura Mater and its Nerves in Cerebral Traumatism. See *Brain* (1878), Vol. I., p. 29.

[This is to us an important item.] "These symptoms tend to diffuse and invade neighboring groups of muscles. They have never the localization, the measured and purposed character of the contractions which belong to the lesions of the cortex. They frequently become transformed into permanent contractures.

"(b) The reflex vasomotor disturbances, due to irritation of the nerves of the dura mater, consist in spasms or congestive paralysis of the cerebral and ocular vessels, either on the same or the opposite side.

"These facts are important to pathologists, as they show the great influence of irritation of the nerves of the dura mater on cerebral vascular conditions, and on the organs of sense, and on the causation of secondary effects in cerebral traumatism, *i. e.*, on the congestions and inflammations of the cerebral membranes.

"II. Destructive lesions cause local anæsthesia of the dura mater."

I have made this long quotation from Duret because of its importance.

[To be Continued.]

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## AN EXPERIMENTAL AND CLINICAL STUDY OF AIR EMBOLISM.

[Continued from page 50.]

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### EXPERIMENTS ON VENOUS AIR EMBOLISM.

THE injection of air was always made into the jugular vein. The neck was shaved and the surface disinfected with a 5 per cent. solution of carbolic acid. Ether was always used as an anæsthetic, the animal being kept fully under its influence until everything was in readiness to throw in the air, when the inhalation was suspended and the animal was allowed to come out from under its influence, for the purpose of studying the effects of the air on the heart and respiration,

independently of the effects of the anæsthetic. The vessel was freely exposed, usually in the lower part of the neck, by a parallel incision. After isolating it to the extent of from two to four inches the influence of the respiratory movements of the chest on the venous circulation was carefully studied. Then a hæmostatic forceps was applied to the distal portion of the vein. Below the point of compression the blood was forced out of the vessel between two fingers, and its return prevented by applying another pair of forceps to the proximal end of the exposed vein. We had thus a bloodless portion of vein between the two forceps, presenting a ribbon-like band. This was partially divided in an oblique direction for the purpose of facilitating the introduction of a canula. The canula was securely fastened in the vein by a ligature, when the proximal pair of forceps were removed, and, by compressing the bulb, the air was injected with force so as to imitate as nearly as possible the conditions present during the accidental introduction of air.

The canula was connected with a rubber bulb of known capacity by means of a rubber tube. After the completion of the experiment (if the animal survived) the vessel was divided completely, and both ends ligatured with catgut, and the wound closed with a continued catgut suture. The weight of the animal and amount of air injected were estimated accurately, in most instances.

*Experiment No. 1.* Sheep weighing 120 pounds. Left jugular vein. The vessel was opened in its lower third, but no air entered. A rubber tube was introduced for a distance of two inches, with a view of facilitating the spontaneous ingress of air; but this accident failed to occur. Air was injected at intervals of eight minutes in quantities of 30 c. cm. each, until the enormous amount of 480 c. cm. had been introduced.

After the first injection nothing was observed that indicated the presence of air in the veins or the heart. After the second dose a slight splashing sound could be heard over the cardiac region, which became louder and more distinct as the amount of air in the right side of the heart increased. The first serious symptoms observed were a tumultuous action of the heart, and difficulty in breathing, which became aggravated by every succeeding injection. Towards the end of the experiment, which lasted nearly two hours, the animal was attacked, at short intervals, by general convulsive movements. After the suspension of respiration the heart's action became very slow and feeble, and, at times, irregular. The immediate cause of death was plainly due to asphyxia, as manifested by the great dyspnoea and the cyanotic hue of all visible mucous surfaces.

On examination after death, a few air-bubbles and only a small amount of dark blood were found in the left ventricle. The right ventricle was arrested in the diastole, and contained a large quantity of very dark, almost black, spumous blood. Air-bubbles were found in a number of distant arteries of small size.

*Experiment No. 2.* Adult, large cat. In this instance the canula was introduced and tied in the left jugular vein. The heart was exposed before the injection was made, with a view of observing directly the effects produced by sudden inflation of

the right cavities of the heart. Before the air was introduced the heart contracted regularly—artificial respiration being made for the purpose of preventing death by asphyxia. As soon as the right side of the heart was distended by the air, the left auricle and both ventricles ceased to contract, while the right auricle continued to pulsate. The pulsations were feeble and irregular. The coronary veins became filled with air-bubbles, presenting the appearance of a rosary. On opening the superior vena cava, air and frothy blood escaped, the right side of the heart collapsed, and all chambers of the heart commenced to contract regularly, and with considerable force. The pulsations continued for 15 to 20 minutes, becoming more feeble and irregular, and intermittent towards the last. After death, air was found in both venæ cavae and the iliac veins. The left ventricle was completely empty. In this case, owing to the small size of the heart and the large amount of air introduced, the contractions of the right ventricle were arrested in the diastole while respiration continued. Death took place suddenly from mechanical over-distension of the heart.

*Experiment No. 3.* Dog, weight 65 pounds. Injected 30 c. cm. of air into left jugular vein. Churning sounds over cardiac region, loud and distinct. Heart's action became very tumultuous and intermittent. Respirations superficial and rapid. The animal was bled from the distal end of the jugular vein to the amount of 4 ounces, whereupon the heart's action became regular, and the respirations diminished in frequency. The vein was divided completely, and both ends were tied with fine catgut ligatures,—the wound being closed in the usual manner. For a number of days the dog appeared quite unwell, showed no disposition to eat, and acted very stupid, being inclined to sleep most of the time. In this case the intravascular pressure was promptly relieved by free bleeding, which enabled the heart to force the air through the pulmonary artery into the general circulation. The stupid condition of the animal was undoubtedly owing to embolism of the cerebral vessels, which disappeared after the disappearance of the air-emboli by absorption.

*Experiment No. 4.* Adult, medium-sized cat. Injected 15 c. cm. of air into left jugular vein. Heart's action arrested at once. Respirations, which were irregular, ceased a few moments later. The chest was opened at once. The right side of the heart was found enormously dilated and almost motionless. Coronary veins filled with air. The right ventricle was punctured with the needle of an aspirator and its contents withdrawn, when the pulsations were reestablished. The ventricle was again inflated through the needle of the aspirator. Five minutes after this injection the pulsations numbered about 250 per minute. Five minutes later the left auricle ceased to contract, the movements of the right being irregular, and about 80 to the minute. After the lapse of another five minutes the pulsations of the ventricles were only 17 per minute; and a little later, all movements ceased.

This experiment demonstrates that the arrest of the heart's action was due to mechanical over-distension, as aspiration of the right ventricle was followed by regular and strong contractions in all cavities of the heart. The contractions were not the result of the mere mechanical irritation of the heart by the puncture, as other and equally severe irritants were previously applied without producing any effect.

*Experiment No. 5.* Dog, weight 35 pounds. Before operation respirations, 40; pulse, 140. Injected 20 c. cm. of air into right jugular vein. Convulsions followed, which lasted for about two minutes. Respiration rapid and stertorous. Pulse, 300. After five minutes the animal made repeated attempts to get up and walk, but invariably fell down on account of imperfect control over the movements, or paralysis of the posterior extremities. Half an hour later the animal was able to walk, but appeared very

feeble. Pulse, 120; respirations somewhat accelerated. Recovery was complete. In this case the equilibrium of the circulation was soon restored, and the air in the right side of the heart passed through the pulmonary into the general circulation in a very short time, as was evident from the presence of symptoms indicative of embolism of some of the vessels in the cerebro-spinal centres.

*Experiment No. 6.* Dog, weight 75 pounds. Injected 60 c. cm. of air into the right jugular vein. Churning sounds, loud and distinct; heart's action labored. Respirations exceedingly rapid; later, stertorous. The animal recovered rapidly from the immediate effects of the air embolism, and was soon as well as before the operation.

*Remarks.* These experiments tend to prove the following statements: 1. A small amount of air in the right side of the heart in a healthy animal gives rise only to temporary symptoms, referable to the heart's action and the pulmonary circulation. 2. When air has been introduced into the right side of the heart in such quantities as not to arrest the contractions of the heart at once, it is forced through the pulmonary capillaries into the left side of the heart, by the contractions of the right ventricle. 3. The danger attending the insufflation of air into veins is proportionate to the amount of air introduced, as well as the capacity of the right ventricle to resist intra-cardiac pressure. 4. When a fatal dose of air has been introduced into the venous circulation, death takes place almost instantaneously, from arrest of the heart's action, or later, from suffocation. 5. Spontaneous ingress of air into a wounded, healthy jugular vein never occurred in these experiments, and must be considered a physical impossibility, as the resilient walls of the wounded vein collapse readily when exposed to atmospheric pressure.

Dogs weighing about 30 pounds would usually recover in a short time after an injection of 30 c.cm. of air, while double that amount constituted generally a fatal dose. Sheep required a proportionately larger dose to produce a fatal result. These experiments also tend to prove that animals of the same kind and species do not manifest the same degree of tolerance to the presence of air in veins. Young animals succumb more readily to its effects: in the adult animal the degree of tolerance depends on the more perfect development and contractile power of the right ventricle. In all cases where life was prolonged for a considerable length of time after the injection of air was made, and the ventricular contractions were not much impaired, bubbles of air were found in the left side of the heart, showing conclusively that the air must have passed from the right ventricle through the pulmonary capillaries.

In experiments Nos. 3 and 5, the well marked cerebral disturbances were undoubtedly produced by secondary air embolism of the

vessels of the brain and spinal cord, since these disturbances disappeared after the removal of the emboli by absorption.

When the same amount of air was administered in one dose, it always proved more dangerous than when injected in divided doses, which simply means that during the interval between the injections sufficient time had elapsed for the right ventricle to force at least a portion of air through the pulmonary capillaries into the general circulation, thus preventing for a time at least a fatal degree of intracardiac pressure. The greater the development of the right ventricle, the greater the tolerance of the animal to the presence of air in veins. This statement is well exemplified by the fact that in horses a large amount of air is required to produce death, while in dogs a proportionately much smaller dose will result in death. This is, because in the former animals the right ventricle, from its proportionately greater strength, is more competent to perform an additional task. If death followed immediately after the injection, the dose was usually a large one, the heart's action having been suspended before respiration ceased, and on post-mortem examination the right ventricle and auricle were always found over-distended and tympanitic, containing a moderate amount of blood not intimately mixed with a large amount of air, while the left side of the heart was nearly or completely empty. If death occurred some time after the injection, great dyspnoea was observed, lividity of the mucous membranes, tumultuous action of the heart, and respiration ceased prior to cessation of the action of the heart, showing conclusively that death took place from carbonic acid intoxication. In these cases the necropsy revealed a lesser degree of distension of the right chambers of the heart, which invariably contained spumous blood, or blood intimately mixed with air. The pulmonary artery and its branches were filled with air and spumous blood; and bubbles of air and a small quantity of blood were present in the left ventricle. In opening the jugular vein, I have always noticed that the vessel would promptly collapse as soon as hemorrhage ceased, being transformed into a pale, round cord, in which the wound could be found only with great difficulty. Air was never seen to enter, even if the wound and a portion of the vein were kept patent with forceps or a rubber tube. I frequently arrested the column of blood in the vein by applying a compressing forceps above and opening the vessel below, thus creating the most favorable condition for the spontaneous entrance of air, but the result remained the same. It is, therefore, only reasonable to assume that air will enter spontaneously only in case a vein near the heart is wounded, the walls of which are prevented from collapsing by fixation of its tunics to adjacent, unyielding structures,

or in case the vein walls themselves have lost their resiliency by previous pathological changes.

#### EXPERIMENTS ON ARTERIAL AIR EMBOLISM.

*Experiment No. 1.*—Medium-sized dog. The left carotid artery was exposed and isolated, and two hemostatic forceps applied about two inches apart. The artery was divided between them, and the proximal end secured by a ligature. Into the distal end the canula of the injecting bulb was introduced and fastened with a ligature. When the animal had fully recovered from the anæsthetic, the forceps were removed, and 80 c. cm. of air were injected at once and with considerable force. The canula was then removed and the artery ligated. The animal collapsed almost instantaneously, and respiration was suspended for nearly two minutes. The animal appeared motionless and in a condition of profound stupor. Heart's action tumultuous and very rapid. Two minutes after the injection churning sounds were audible over the cardiac region. When respiration was re-established the movements of the chest were slow and irregular, gradually becoming slower and slower until after about fifty attempts they ceased entirely. The limbs were rigid, and the trunk in a position of opisthotonos. The heart continued to contract for about two minutes after respiration had ceased. All vessels leading to and from the heart were carefully ligated, and the organ removed and examined under water. The coronary veins contained bubbles of air. All cavities of the heart contained air, the largest amount being found in the left auricle. Coagula were present in all the chambers, except in the left auricle. The circle of Willis was distended with air, as were many of the smaller vessels of the brain and its membranes. The cerebral vessels were gorged with dark blood. The air injected into the carotid artery had evidently passed directly through the cerebral capillaries into the venous circulation, giving rise to venous and general air embolism. In the beginning, respiration was immediately arrested from temporary suspension of innervation, but was re-established as soon as the amount of air in the cerebral vessels had lessened sufficiently to allow a better blood supply. It, however, ceased definitely under symptoms expressive of extensive secondary embolism of the pulmonary artery.

*Experiment No. 2.*—Sheep; weight 90 lbs. Left carotid artery prepared as in previous experiment, only that the air was injected in a central direction, towards the heart. After the animal had recovered almost completely from the effects of the anæsthetic, 150 c. cm. of air were thrown in, and the proximal end of the artery was tied. The animal was at once thrown into a tetanic state, with rigid limbs and retracted neck. All reflex movements and sensations were completely suspended. The heart's action was irregular and tumultuous, and over the cardiac region distinct churning sounds were heard. Respirations exceedingly rapid. The mucous membranes, accessible to sight, presented a strikingly pale and anemic appearance. Death occurred in fifteen minutes, respiration ceasing first. Examination immediately after death showed the right ventricle greatly distended and tympanitic on percussion. It contained spumous blood, air, and a few small coagula. Left ventricle contained only a minute quantity of spumous blood and fine blood clots, adherent to the endocardium. Air emboli were found in almost all vessels throughout the body. Coronary arteries distended with air. Jugular veins contained more air than blood. Basilar artery and superior longitudinal sinus contained a large amount of air. The tongue and other distant organs extremely anemic. Although this large quantity of air was thrown directly into one of the large arteries, it was forced into the smallest



vessels, and through the capillaries into the veins and the right side of the heart by the powerful contractions of the left ventricle, giving rise to a combination of symptoms arising from arterial and venous embolism. Death was finally produced in a similar manner as if air had been injected directly into the veins. Some of the air had passed all the capillaries, and was found in the left side of the heart.

*Experiment No. 3.*—Medium-sized adult cat. With a view to ascertain how soon air would pass through the capillary vessels after injecting it into the carotid artery, the jugular on the opposite side was opened before the injection of air was made. About 15 c. cm. of air were thrown into the carotid artery in a peripheral direction. The animal was immediately seized with convulsions, and died in less than a minute. Respiration ceased first. Air was seen to escape from the wound in the jugular vein, and was also found in nearly all the vessels throughout the body. On opening the chest, the right side of the heart was found distended to its utmost and tympanitic on percussion. The contractions of the right auricle were twice as rapid as the ventricular pulsations. The movements of the left auricle were the same in frequency as the ventricular pulsations. The left auricle ceased to contract seven minutes after death. The right ventricle was punctured with the needle of an aspirator, and its contents removed, whereupon the contractions became much stronger.

8 min. after death ventricles contracted 44 times per min. ;									
10	"	"	"	"	"	30	"	"	"
12	"	"	"	"	"	16	"	"	"
18	"	"	"	"	"	16	"	"	"
29	"	"	"	"	"	6	"	"	"

Then all contraction ceased, and could not be restored by any kind of irritation. Right auricle ceased beating in ten minutes after death, but commenced to contract again nineteen minutes later, contracting 24 times a minute, the movements becoming more rapid and at times irregular for 48 minutes after death.

*Experiment No. 4.*—Dog; weight 35 lbs. Into the right carotid artery 80 c. cm. of air were injected in a proximal direction. The animal was seized at once with convulsions of a tetanic character, with the limbs extended and rigid. Involuntary discharges from bowels and bladder; sensation, motion and reflex actions suspended; pupils contracted; respirations very rapid; heart's action slow and labored. The left jugular vein was opened, and four ounces of blood were abstracted with the result of greatly improving the heart's action. Both vessels were ligated, and the wound closed. The animal was in a profound stupor, resembling complete anaesthesia, until death occurred 2½ hours after the operation. Half an hour after the injection, the pulse was 74; respirations 44 per minute. On opening the abdomen, the large veins were found very much dilated, and contained air. Large air-bubbles were also found in the pulmonary artery, internal mammary and coronary arteries. Small thrombi were found in many of the ultimate branches of the pulmonary artery. The right side of the heart was distended with spumous blood and air. The left ventricle was almost completely empty, the endocardial lining presenting many patches of sub-serous ecchymosis. Nearly all the vessels of the brain and the longitudinal sinus contained air. Cerebral and meningeal vessels engorged with blood. The animal died with marked symptoms of asphyxia. The tetanic rigidity of the extremities and the muscles of the trunk, as well as the remaining prominent cerebral symptoms, were produced by the intense collateral congestion, the result of obstruction of some of the smaller vessels by air emboli.

*Experiment No. 5.*—Adult dog; weight 20 lbs. Into the peripheral end of the right carotid artery 20 c. cm. of air were injected, after the animal had completely

recovered from the anæsthetic. The dog collapsed almost immediately, and fell to the floor, perfectly unconscious, with extended and rigid limbs. Breathing exceedingly rapid, but gradually growing slower as consciousness returned. When the animal attempted to walk it staggered and frequently fell, having apparently lost the power of co-ordination in the posterior extremities. The pupils, at first dilated, later became very much contracted. After about two hours, the animal walked without difficulty, but respiration, as well as the heart's action, continued very rapid. The next day complete recovery had taken place. Aside from the cerebral and spinal symptoms, the arterial embolism in this case resulted in no serious consequences. The most threatening symptoms were referable to venous embolism, showing that most of the air had passed through the capillaries into the venous circulation and right side of the heart.

*Experiment No. 6.*—Adult dog; weight 22 lbs. Right carotid artery exposed, and 45 c. cm. of air injected towards the heart. Involuntary discharges from bladder and rectum. Pupils dilated; later contracted. Animal completely unconscious; anterior limbs extended and rigid; slight opisthotonos; breathing mostly abdominal. Churning sounds heard over heart a few seconds after injection, disappeared after eight minutes. Respiration ceased five minutes after the air was injected, but was again restored by artificial respirations and faradization of vagus and diaphragm. 23 minutes after the injection, pulse 128, respirations 24; 17 minutes later, pulse 105, respirations 26; 52 minutes after injection, pulse 120, respirations 20; 90 minutes after injection, pulse 180, respirations 20. At this time the animal made several unsuccessful attempts to rise, but relapsed into a comatose state, which continued until death, 15 hours after the operation.

At the post mortem examination, the arteries contained a good deal of dark, almost venous blood, interspersed with bubbles of air. Air was found in the uterine, ovarian, iliac and mesenteric arteries, and aorta; also in both venæ cavae, pulmonary artery, and veins. Some of the smallest branches of the pulmonary artery were obstructed by thrombi. Right ventricle distended with very dark, almost black, frothy blood. Left ventricle firmly contracted and almost empty. Left auricle contained dark, spumous blood. Coronary arteries distended with air; internal mammary arteries and veins also contained it. Air was found in all the cerebral vessels and sinuses, which were distended with dark, fluid blood. Vessels of spinal cord were intensely congested, and contained numerous air bubbles. The mucuous membrane of the stomach presented 11 points of extravasation, the largest being circular and one inch in diameter. This case presented the most diffuse form of embolism, the emboli being found equally numerous and diffuse in the arterial and venous system. The multiplicity and diffusion can be satisfactorily accounted for, when we take into consideration the large amount of air which was injected, and the length of time which had elapsed from the time of insufflation until death occurred. The post mortem examination plainly indicated that death was produced by slow asphyxia. The primary unconsciousness and stupor were induced by the acute cerebral ischæmia; then a short period of consciousness returned as soon as the collateral circulation in the brain had become partially established, when again the animal became comatose from carbonic acid intoxication. The abstraction of blood relieved the threatening symptoms attending the arterial embolism, but failed in preventing death from asphyxia by secondary venous embolism.

*Experiment No. 7.*—Dog; weight 26 pounds. Injected 15 c. cm. of air into the right carotid artery, in a peripheral direction. The animal had a slight convulsion, and remained unconscious for about 20 minutes, when it rallied and was able to walk

about the room with a slightly staggering gait. No complications followed the operation. In this instance the cerebral symptoms followed the insufflation instantly, but owing to the small amount of air injected, they were only of short duration. The air, passing the capillaries in a short time, entered the venous circulation, where it produced temporary disturbances in the pulmonary circulation.

*Remarks.* Injection of air into arteries produces well-marked and characteristic symptoms which point directly to a disturbance in the circulation of the brain and spinal cord. The most prominent symptoms are convulsions, coma, tetanic rigidity of the limbs and extensor muscles of the back. The coma resembles complete and profound anæsthesia. These symptoms follow the operation more quickly if the injection is made in a peripheral direction toward the brain. If the animal does not succumb to the primary effect of the air upon the brain and medulla oblongata, a series of symptoms succeed which announce the arrival of air in the veins and right side of the heart. All of the experiments show that it only requires a few seconds for the powerful contractions of the left ventricle to force at least a large portion of the air through the capillaries into the veins. The primary effect of embolism of the vessels of the brain is to produce acute cerebral ischæmia, the intensity of which depends upon the number and size of the vessels which have become obstructed by the air emboli. This anæmia soon gives rise to intense engorgement of the collateral vessels and the vessels behind the point of obstruction, and engorgement to such an extent that it often leads to rupture of capillary vessels and hemorrhage into the paravascular tissues. Unless the amount of air injected is sufficient to prove rapidly fatal by causing suspension of functions of the cerebro-spinal centres, the animal dies from asphyxia from embolism of the pulmonary artery—the same as though the air had been injected directly into the veins. The left ventricle, from its greater thickness and consequently more powerful contractions (as compared with the right ventricle), is better adapted to overcome the increased resistance, and hence the air is rapidly forced through the systemic capillary circulation into the veins and right side of the heart. On this account an equal amount of air injected into arteries is not so dangerous as when introduced directly into veins, as a certain percentage of it never reaches the veins and right side of the heart. Arterial air embolism is attended by an additional source of danger, which consists in the greater tendency to coagulation of blood in the heart and vessels, as was noted in several experiments.

#### DIRECT INTRA-CARDIAC INSUFFLATION OF AIR.

These experiments were made with a view of demonstrating by ocular inspection, that sudden over-distension of the cardiac muscles

will arrest their contractility, and will thus produce paralysis of the heart in the diastole.

*Experiment No. 1.*—Medium-sized cat. After the animal was fully under the influence of ether, respirations and heart's action being normal, the chest was rapidly opened and the heart exposed. Its movements remained regular. From the sudden ingress of air into the cavity of the chest, the left lung collapsed, and it was found necessary, in order to prevent asphyxia, to make artificial respirations on the right side of the chest. The pericardium having been opened, the right ventricle was punctured with the needle of an aspirator, and air injected in sufficient quantity to distend the right chambers of the heart, which immediately ceased to contract. On emptying the right ventricle, by withdrawing the air and blood, the rhythmic movements of the organ were restored. These manipulations were repeated at least half a dozen times, and always with the same uniform and constant results. Half an hour after opening the chest all movements of the heart ceased. The heart was now removed and immersed in water at a temperature of  $105^{\circ}$  F., when it again commenced to pulsate at the rate of 120 beats per minute. After the lapse of about two minutes, it was removed from the warm water, still pulsating, and transferred to cold water, when all movements ceased instantaneously, and all efforts to revive them proved futile.

*Experiment No. 2.*—Large Maltese cat. Heart exposed, right ventricle punctured, and 11 c. cm. of air injected, with the result of immediately arresting the pulsations of the right ventricle. When the air was withdrawn, the regular movements were renewed. This experiment was repeated on both ventricles eight or ten times in the course of half an hour, with the same results. The auricles during all this time continued to contract. Ten minutes after the last puncture and evacuation, the ventricles were still pulsating.

*Remarks.* Both of these observations support the statement that sudden over-distension of any of the cavities of the heart by inflation of air will arrest its movements in the diastole, and that upon the removal of the increased intra-cardiac pressure, the movements of the organ are restored. It was found that by continuing the injecting force after the right ventricle had become distended, air could be forced readily through the pulmonary capillaries into the left side of the heart. In some instances one of the cavities of the heart was kept over-distended and at rest for at least a minute, and yet, on removing its contents, the rhythmic movements were resumed.

#### ASPIRATION OF RIGHT VENTRICLE FOR AIR-EMBOLISM.

Being satisfied of the fact that sudden over-distension of the right ventricle may and does produce paralysis in the diastole, it appeared reasonable to resort to some direct measure in removing the cause of over-distension in grave cases of venous air-embolism. Puncturing and aspiration of the right ventricle seemed to offer the best chances for accomplishing this object. In the following experiments artificial

venous air-embolism was produced in the usual way, when the right ventricle was punctured with the needle of an aspirator two millimetres in diameter, and the contents of the right side of the heart removed by aspiration. The region over the heart was shaved and disinfected, and the exact point of puncture located before the animal was anaesthetized. The needle was always carefully disinfected by passing it through the flame of an alcohol lamp and immersion in carbolized water. When the puncture was made, the needle was advanced first only sufficiently deep so as to bury the opening in its point beneath the tissues, when a vacuum was created in the aspirator so that the entrance of the needle into the ventricle would be promptly announced by the escape of spumous blood. By following this precaution additional injury to the heart (by pushing the needle further than into the cavity of the ventricle) was avoided, and, at the same time, a prompt escape of blood was secured. Experience taught me that it was very important not to push the needle too deeply into the cavity of the ventricle, not only for fear of inflicting additional injury to the endocardial lining opposite the point of entrance, but more particularly with a view of removing the free air which would naturally occupy the highest point in the cavity, if it was not intimately mixed with the blood. The needle was always directed obliquely from below upwards, for the two-fold purpose of making a valvular wound in the ventricle and of avoiding unnecessary injury to the endo-cardium.

*Experiment No. 1.*—Dog; weight 31 lbs. Sixty c. cm. of air were injected into the left jugular vein. The animal was seized immediately with convulsions, followed by collapse; heart's action tumultuous; churning sounds over the heart were distinctly perceptible; respirations rapid and superficial. Right ventricle was punctured and 120 c. cm. of spumous blood were withdrawn. Pulsations of heart became more feeble, and as respirations had ceased and could not be restored, the chest was opened. The right ventricle was found moderately dilated and still contracting. Slight contractions of lower portion of left auricle. Left ventricle contracted, but without motion. The needle of the aspirator was then introduced into the right auricle, which was distended and tympanitic. After emptying it, it commenced to contract. All contractions ceased half an hour after the air was introduced. Faradic currents had no effect upon the heart after it had ceased to contract. The pericardium contained air in considerable quantity and about 4 c. cm. of fluid blood. Air was found in the right side of the heart, the left ventricle, coronary veins, and in the large veins in the immediate vicinity of the heart. Puncture about an inch from septum and nearly equi-distant between the apex and base of heart. No injury of endo-cardium on opposite side.

*Experiment No. 2.*—Sheep; weight 95 lbs. Before operation, respirations 86; pulse 140. Injected 150 c. cm. of air into left jugular vein, which was immediately followed by convulsions and involuntary discharges. Aspiration of right ventricle, and removal of 150 c. cm. of spumous blood. As the animal still presented an asphyxiated appearance, the ligature was removed from the distal end of the jugular

vein, and about 120 c. cm. of blood were allowed to escape. The animal showed no signs of improvement, and died 5 minutes after the injection was made, having made only five attempts at respiration during the time. Pericardium contained a small coagulum and a few bubbles of air. Right ventricle, distended and tympanitic, contained spumous blood. Two punctures were found over the middle of the right ventricle about one-half cm. apart; the second was made during the convulsive movements of the animal, which necessitated a partial withdrawal and re-introduction of the needle. On the inner surface each puncture was hermetically sealed by a minute thrombus, which projected only very slightly into the cavity of the ventricle. In the left ventricle, which was firmly contracted and empty, a small filiform coagulum projected through the aortic orifice into the aorta.

*Experiment No. 3.*—Old dog; weight 40 lbs. Injected 45 c. cm. of air into left jugular vein; churning sounds over heart, loud and distinct; heart's action labored; respirations exceedingly rapid; no convulsions, but profound coma and involuntary discharges. A little more than one minute elapsed between the introduction of air and aspiration, during which time the heart's action became more and more embarrassed, and all of the symptoms became so grave that death seemed unavoidable. But as the needle reached the heart, a slight impulse was imparted to it by the feeble pulsations, and 120 c. cm. of air and spumous blood were removed. The heart's action improved immediately, but the dyspnoea, although less severe, was still quite prominent. Consequently, an additional 120 c. cm. of blood were allowed to flow from the peripheral extremity of the jugular vein, which promptly relieved the urgent symptoms. Ten minutes after the injection, respirations were 240 per minute; four minutes later 360, and after eight minutes more 120. After 40 minutes the stupor disappeared, and the animal was able to walk. One hour after the operation, respirations were 20 and pulse 160 per minute. At this time the animal walked home, a distance of nearly two miles, and subsequently suffered no inconvenience from the operation.

*Experiment No. 4.*—Dog; weight 75 lbs. Injected into left jugular vein 90 c. cm. of air, which produced intense difficulty in breathing and profound stupor. Sensation and reflex movements suspended. Heart's action exceedingly feeble and rapid. Churning sounds distinct. The aspirator and needle were kept in readiness to be used promptly on the approach of symptoms indicative of impending death. Two minutes after the injection the animal was apparently in a dying condition, when the needle was plunged into the right ventricle, and from its rapid oscillations it was apparent that the heart's action had not entirely ceased, but was very rapid and feeble. As quickly as possible 180 c. cm. of spumous blood were withdrawn, which promptly relieved the most urgent symptoms, but as the respirations still remained rapid and labored, the ligature was removed from the distal end of the jugular vein, and 240 c. cm. of blood were allowed to escape. Eight minutes later, after the injection, the churning sounds over the heart were still present, but faint. Respirations 144; pulse 130. When the animal had recovered from the immediate effects of the operation, it was noticed that the posterior extremities could be moved only with difficulty, the gait being slow and staggering. For twelve hours the animal was dull and stupid, remaining in the same place without change of position. The drowsiness continued for 36 hours, after which the animal became lively, and went on to complete recovery without any further interruption. In this case it was apparent that the animal would have died from the large volume of air which had been injected, but for timely use of the needle and aspirator. Three weeks after the experiment the animal, being in perfect health, was killed by an arterial injection of air. No

signs of pericarditis, endocarditis, or myocarditis. Puncture in ventricle indicated by a minute faint cicatrix.

*Experiment No. 5.*—Old dog; weight 25 lbs. In this case the aspirator was used a few seconds after the insufflation of air was made, and the result shows how important it is to withdraw the air from the ventricle before it has had time to escape into the pulmonary artery. Immediately after the injection of 90 c. cm. of air into the left jugular vein, the animal became comatose. Respiration exceedingly rapid, and heart's action imperceptible. The right ventricle was punctured at once, and as soon as a part of its contents had been removed, the impulse of the heart was imparted to the needle, which could be distinctly seen and felt. Spumous blood and air to the amount of 150 c. cm. were withdrawn. The dog rallied rapidly after the aspiration, being able to walk in less than half an hour. He manifested no pain or discomfort from the air embolism or operation. The volume of air in this case was three times as large as in the previous experiment, when the weight of the animals is compared. The immediate effects of the air were expended upon the heart, as was made evident by the temporary cessation of its pulsation, and yet death was prevented by the prompt removal of the excessive intracardiac pressure. The recovery was more rapid than in the previous cases, from the fact that not so much air had passed into the pulmonary artery, and more was removed by aspiration. Two weeks later, the animal being in perfect health, 60 c. cm. of air were injected into the right jugular vein, which produced death in a few minutes, showing conclusively that the recovery, after the first insufflation, was due to the aspiration. Cicatrix of puncture plainly visible. No signs of inflammation in the pericardium, endocardium, or substance of the heart.

*Experiment No. 6.*—Young dog; weight 28 lbs. In this experiment 120 c. cm. of air were thrown into the left jugular vein, in divided doses of 30 c. cm. each, in rapid succession. During the third injection the animal howled and became comatose, and immediately after the last injection the heart's action ceased, and respirations were reduced to a few irregular gasps. The right ventricle was punctured, and 120 c. cm. of spumous blood and air were withdrawn, without producing any effect upon the heart. Artificial respiration was resorted to, without any better result. The chest was opened at once. The pericardium contained 4 c. cm. of dark, venous blood and a few air bubbles. Right auricle continued to contract 48 times per minute. Left auricle and ventricle were distended and contained spumous blood. The needle had punctured the right auricle, instead of the ventricle. All muscles, voluntary and involuntary, reacted promptly to the faradic current, but it had not the slightest effect upon the heart.

*Experiment No. 7.*—Young dog; weight 10 lbs. Injected 45 c. cm. of air into the left jugular vein. At the end of the injection the dog howled, and the heart's action ceased almost instantaneously. The right ventricle was aspirated, and 60 c. cm. of spumous blood were withdrawn. Artificial respiration was performed, and the faradic current was applied, when the dog made a few ineffectual attempts at respiration before he died. On examination, the pericardium was found to contain a slight amount of dark, fluid blood, and a few air bubbles. Both auricles contracted about 48 times in a minute. Right ventricle arrested in diastole. Puncture was found near base of ventricle. Right ventricle was again aspirated, and the faradic current was applied to the heart and the needle, without producing the slightest effect. Right ventricle and pulmonary artery contained spumous blood. Left ventricle contracted and nearly empty.

*Experiment No. 8.*—Adult dog; weight 24 lbs. Before operation, respirations 80,

pulse 100 per minute. Injection of 30 c. cm. of air into left jugular vein. Immediately after injection, great restlessness, dyspnoea, and tumultuous action of heart; churning sounds loud and distinct. Removed 90 c. cm. of spumous blood from right ventricle by aspiration. After the aspiration, the improvement in respiration and pulse was marked. Recovery complete and not attended by any complications.

*Experiment No. 9.*—Same animal as in experiment No. 3. Animal in perfect health. Time since first operation, 3 weeks. Injection of 40 c. cm. of air into right jugular vein. Symptoms the same as before. At the end of  $3\frac{1}{2}$  minutes the pulsations of the heart ceased, and the respirations were nearly suspended. The right ventricle was now punctured, and 250 c. cm. spumous blood were removed. No motion imparted to needle. Faradization and artificial respiration were ineffectual in restoring either the heart's action or respiration. On examination, 30 c. cm. of dark, fluid blood were found in the pericardium. No evidences of inflammation from former puncture. Right ventricle moderately distended with a clot of spumous blood. Point of second puncture one-half inch from coronary artery. The location of first puncture was marked near the base of right ventricle by faint minute cicatrix upon the pericardial surface, while the endocardium, at a corresponding point, showed an old circumscribed spot of ecchymosis, but no evidences of inflammation. Left ventricle contained no air, and only a minute quantity of fluid blood. Both auricles nearly empty. Pulmonary artery contained air and spumous blood. This experiment demonstrates positively and conclusively the value of early aspiration of the right ventricle in venous air embolism, where death is threatened by over-distension of right side of the heart, or by asphyxia. In the former experiment a larger amount of air was injected, but the animal was saved by an early aspiration, by which a large amount of air was removed before it had time to accumulate in the pulmonary artery. It also illustrates the utter uselessness of resorting to any kind of mechanical interference after a fatal dose of air has once passed beyond the semi-lunar valves into the pulmonary artery. In such instances the air has passed beyond our reach, and will inevitably lead to a fatal result by asphyxia.

*Experiment No. 10.*—Adult dog; weight 18 lbs. Injection of 60 c. cm. of air into the left jugular vein. Immediate collapse; churning sounds distinct; aspiration of 100 c. cm. of air, and spumous blood from right ventricle. Three minutes after the insufflation, respiration and heart's action had ceased. No air or blood found in the pericardium. Needle puncture equidistant between base and apex of right ventricle, and about 2 cm. from septum. Right auricle contracting feebly 40 times a minute. Right ventricle dilated; fibrillary contractions at apex only. Right ventricle and pulmonary artery contained spumous blood. Left auricle and ventricle contained only a slight amount of fluid blood and a few air bubbles.

*Remarks.* These experiments serve to illustrate the following interesting points in pathology and surgery:

1. The heart can be punctured with a perfectly aseptic, medium-sized needle of an aspirator, without any great immediate or remote danger.
2. Aspiration of the right ventricle for venous air-embolism, when done early enough (before a fatal dose of air has been forced into the pulmonary artery), must be considered in the light of a life-saving operation.

Although the needle used in all of these experiments was two milli-



metres in diameter, the hemorrhage into the pericardium was never sufficient in quantity to prove a source of danger. The largest quantity found was 30 c.cm. (in experiment No. 9). In a number of cases no trace of blood was found in the pericardium. Against my expectations the same observations were made in regard to air. In one case the pericardium contained about 60 c.cm. of air, while in most cases only a few isolated air-bubbles were seen, while in others no trace of it could be found. In all cases where the animal survived the operation and was killed from a few days to three weeks subsequently, no trace of inflammation could be found either in serous membranes, muscular tissue or adjacent organs. Even adhesion between the parietal and visceral layers of the pericardium at the point of puncture never occurred. The point of puncture was usually marked by a faint, minute cicatrix in the visceral pericardium, unaccompanied by any pathological changes in the substance of the heart. We take it for granted that if effusion of blood or air occurred into the pericardium in the animals which recovered, these adventitious substances caused no irritation, but were promptly removed by absorption.

With the exception of the subject of experiment No. 8, it may be safely assumed that all of the animals would have died, had aspiration not been performed, so that the operation saved at least three of the animals out of ten, or the whole number of experiments. The most conclusive proof of this statement was furnished by the subjects of experiments Nos. 3 and 5, as these animals died during subsequent experiments from the introduction of a much smaller quantity of air. The question naturally arises, Why were not all of the animals saved by the aspiration? In reply, it may be stated, that the amount of air injected in most instances was large—more than was necessary to produce a fatal result. Another element of failure consisted in the postponement of the aspiration until a fatal dose of air had passed beyond the reach of the aspirator. To prevent death by air-embolism it is essential to remove the air from the right ventricle as soon as possible after its entrance, before a fatal embolism of a pulmonary artery has had time to take place. In some of the experiments a fatal result might have been probably prevented by removing a larger quantity of air and blood with the aspirator, as in some instances the condition of the animal was improved by a subsequent venesection from the jugular vein.

#### CATHETERIZATION AND ASPIRATION OF RIGHT AURICLE FOR VENOUS AIR-EMBOLISM.

In grave cases of accidental air-embolism it would be a desideratum to be in possession of some means by which the air could be removed

directly from the right side of the heart in the shortest possible space of time and with the simplest implement. An aspirator is not always at hand, and less frequently in a proper condition to be used on such short notice. It appeared to me, that inasmuch as the accidental introduction of air usually takes place through wounds in one of the jugular veins, a catheter might be introduced through the wound into the vein and from there passed directly into the heart, and through it the air and spumous blood could be withdrawn by aspiration. A catheter is almost always at hand, and its introduction could require only a few moments of time. The following experiments were made to test the feasibility of this procedure:

*Experiment No. 1.*—Adult dog; weight 24 lbs. The right jugular vein was opened, and 60 c. cm. of air were introduced in the usual way. The breathing became very difficult, and the heart's action labored. The animal was comatose; pupils dilated. As soon as it could be done, a No. 6, English scale, gum elastic catheter, which had previously been made aseptic, was introduced into the wound and passed into the heart, a distance of 15 cm., and, with an exhausting syringe, 25 c. cm. of air and spumous blood were removed. The animal recovered rapidly from the immediate effects of the air embolism and operation, and subsequently manifested no symptoms of disease.

*Experiment No. 2.*—Young dog; weight 30 lbs. Injected 100 c. cm. of air into left jugular vein. The heart's action ceased almost instantaneously. The same catheter was introduced and pushed forward a distance of 18 cm., and about 120 c. cm. of air and spumous blood were withdrawn by the mouth. At this time respiration ceased, and as no pulsations of the heart could be felt, the chest was opened at once. Fibrillary contractions of right ventricle, which was distended and tympanitic. Left auricle and ventricle contracted and motionless. Right auricle contracted regularly 80 times per minute. Faradic and galvanic currents had no effect on ventricles. Right auricle responded to a galvanic current, slowly and interruptedly. The catheter was again introduced, and its course observed as it entered the right auricle. It was found impossible, by any manipulations, to pass it from the auricle into the ventricle. In every instance it passed from the right auricle directly into the inferior vena cava. The right side of the heart was filled with water, to test the possibility of the moving fluids from the right auricle, without introduction of the catheter into the chamber. A catheter with an open extremity was used. No amount of suction force succeeded in moving any of the fluid, until the open end of a catheter reached the auricle, when both chambers could be readily emptied. As long as the end of the catheter remained in the vein, the walls of the vein in front of the catheter would invariably collapse and close the opening in the catheter completely, on applying suction force. This satisfied me that, in order to remove air or blood from the right side of the heart, it is necessary to introduce the catheter as far as the auricle. It was also evident that, in case the catheter be introduced too far, its distal end would pass into the inferior vena cava, and on aspiration, only venous blood would be withdrawn, not air and spumous blood, from the right chambers of the heart, for the removal of which the procedure was intended. On opening the right side of the heart, a large spongy clot of spumous blood was found in the right auricle, which extended for some distance into the ventricle. Left ventricle contained only a small amount of fluid blood and a few air bubbles. As the heart's action had ceased before catheterization, death was

undoubtedly due to the insullation of air, and not to the formation of a thrombus in the heart.

*Experiment No. 3.*—Adult dog; weight 20 lbs. Injected 30 c. cm. of air into right jugular vein. Catheterization and aspiration of right auricle, by which 90 c. cm. of air and spumous blood were removed, when catheter became impermeable by a thrombus in its interior, and was removed. Before emptying the right side of the heart, the animal was comatose; breathing and heart's action exceedingly rapid. After aspiration, rapid movement and complete recovery. If the catheter, in this instance, had been permitted to have remained longer in the auricle, the thrombus which formed in the anterior of the instrument would undoubtedly have increased rapidly, and would have extended to the auricle, in which event death from thrombus would have been unavoidable.

*Experiment No. 4.*—Old dog; weight 40 lbs. Before operation, respirations 16, pulse 100 per minute. Injection of 90 c. cm. of air into left jugular vein. Passed a No. 5 Nélaton's catheter into the right auricle, a distance of 27 cm., and removed 250 c. cm. of air and spumous blood. Immediately after the insullation the animal uttered a howl and became comatose. Pulse 250 per minute; respirations so rapid that they could not be counted. Seven minutes after catheterization, heart's action very irregular, tumultuous, and about 300 beats per minute. Two minutes later respiration ceased, after which the heart's action became slow and feeble, only to cease a few seconds later. Internal mammary and coronary veins filled with air. Left side of heart contained a small amount of bright, red, frothy blood. Right ventricle, moderately dilated, showed fibrillary contractions. Superior and inferior vena cava, right auricle and ventricle contained a continuous, soft thrombus, the oldest portion of which corresponded to the superior vena cava. The upper portion of the clot in the inferior vena cava contained air. Death, in this instance, was due to the formation of a thrombus.

*Experiment No. 5.*—Adult dog; weight 25 lbs. Injection of 60 c. cm. of air into left jugular vein produced immediate collapse, distressing dyspnoea, and great rapidity and irregularity of heart's action. The dog howled, when the heart's action ceased and respiration became gasping. Some delay was experienced in the introduction of the catheter, and when the instrument was in place all signs of life had disappeared. About 50 c. cm. of spumous blood withdrawn, without any signs of improvement. Artificial respiration and faradization were resorted to, without producing the slightest impression. On opening the chest, it was observed that the right auricle contracted about 30 times per minute. Irregular fibrillary contractions of apex of right ventricle. Right side of heart moderately distended with spumous blood. No thrombus. Left ventricle almost empty.

*Experiment No. 6.*—Adult dog; weight 15 lbs. Injection of 60 c. cm. of air into right jugular vein. In this case the catheter was connected with a rubber tube three feet in length, which was kept in water; then the instrument was pushed along the jugular vein into the right auricle. The injection of air was followed by the most urgent and distressing symptoms. Only a small amount of dark, venous blood escaped through the rubber tube until the catheter reached the right auricle, when a gush of spumous blood escaped from the tube under water. As the blood did not continue to escape, about 60 c. cm. of spumous blood were withdrawn. After the aspiration, the symptoms improved rapidly, and within 25 minutes, with the exception of a slight excess in the respiratory movements, the animal appeared to be perfectly well. The ultimate recovery was complete, and not disturbed by any complications.

*Experiment No. 7.*—Adult dog; weight 48 lbs. Before operation, pulse 150, respiration 28. Injection of 120 c. cm. of air into right jugular vein. The animal howled and collapsed. Respirations increased at once to 100 per minute. Heart's action tumultuous, and churning sounds loud and distinct. Passed a Nélaton's catheter into the right auricle, and aspirated 360 c. cm. of air and spumous blood; no signs of improvement followed, and in fifteen minutes the animal was dead. At the post mortem examination, the internal mammary veins were found distended with air. Right side of heart tympanitic and distended. Slight fibrillary contractions of right auricle. Apex of right ventricle contracted regularly 22 times per minute. Coronary veins filled with air. A thrombus had formed, which extended from the superior vena cava into right auricle, ventricle, and for a distance of 25 cm., into the inferior vena cava. Pulmonary artery contained no thrombus, but was distended with air and spumous blood. Left ventricle contracted, contained a small amount of fluid blood and air bubbles. It was quite evident that the thrombus had primarily formed around the catheter, and by new additions it finally reached the distal portion of the inferior vena cava. Death was produced by thrombosis.

*Remarks.* The therapeutical value of catheterization and aspiration of the right auricle for air-embolism is made apparent by the following tabular arrangement of experiments:

<i>No. of Exp</i>	<i>Weight of Animal.</i>	<i>Amount of Air Injected.</i>	<i>Am't of Air and Blood Removed.</i>	<i>Result.</i>	<i>Cause of Death.</i>
1	24 lbs.	60 c. cm.	250 c. cm.	Recovery.	Thrombosis.
2	30 lbs.	100 c. cm.	120 c. cm.	Death.	
3	20 lbs.	30 c. cm.	90 c. cm.	Recovery.	
4	40 lbs.	90 c. cm.	250 c. cm.	Death.	Thrombosis. Air Embolism.
5	25 lbs.	60 c. cm.	50 c. cm.	Death.	
6	15 lbs.	60 c. cm.	60 c. cm.	Recovery.	
7	48 lbs.	120 c. cm.	360 c. cm.	Death.	Thrombosis.

From this table it will be seen that, of seven animals subjected to the operation, three recovered and four died. The amount of air injected in the subjects of experiments Nos. 1 and 6 was sufficient to destroy life, so that we can safely assume that the animals would have died, but for the speedy resort to catheterization and aspiration. In the subject of experiment No. 3 recovery might have taken place without the operation, as the relative quantity of air was much smaller. In the four fatal cases death was produced only once from the presence of air, while the direct cause of death in the remaining three was due to thrombosis. All possible precautions were exercised to prevent the accident. The catheter was made aseptic by thorough cleansing and immersion in a five per cent. solution of carbolic acid. Before the operation the instrument was kept ready for use in an alkaline solution of the temperature of the body, and yet this accident happened in three of seven cases. It is now asserted that the introduction of aseptic bodies into the circulation does not give rise to thrombosis, and

it may be possible that some of the instruments, in spite of the pains taken to render them aseptic, were still not in a fit condition to be used for such a purpose. Catheterization and aspiration of the right auricle for air-embolism compare favorably with puncture and aspiration of the right ventricle as a life-saving procedure, but the former operation is more dangerous on account of the tendency to the formation of a thrombus within or around the catheter. If this formation of a thrombus could be avoided with certainty, catheterization and aspiration of the right auricle would recommend itself as the most expedient and reliable therapeutic agent in cases where life is threatened by air-embolism.

[To be Continued.]

## EDITORIAL ARTICLES.

### SCHEDE'S RESULTS WITH CORROSIVE SUBLIMATE AS AN ANTI-SEPTIC SURGICAL DRESSING AT THE HAMBURG GENERAL HOSPITAL.

It is now more than ten years since the warm recommendation of Listerism in its unmodified form, which came from the City Hospital at Munich, had such a decided effect in establishing antiseptic surgery in Germany. That hospital, which till then was in a most unsatisfactory sanitary condition and beset with numerous surgical diseases affecting wounds, was transformed, as it were by magic, into a model clinic by the adoption of the Listerian system, in which henceforth all wounds healed quickly and in the most desirable manner. This course was therefore speedily followed by other hospitals in Germany, and with very similar results.

But what the Munich City Hospital had done for the introduction of Listerism into Germany, the Hamburg Hospital has done for the use of corrosive sublimate as a surgical dressing, and the name of Max Schede, the director of the surgical clinic in that city, will always be associated with its introduction.

It is true, corrosive sublimate had been employed in surgery before its use was adopted in Hamburg.

In a paper read by Prof. Schede at the International Congress at Copenhagen last year, and which has quite recently appeared in pamphlet form in the *Sammlung klinischer Vorträge* of R. Volkmann,<sup>1</sup> the author mentions that von Bergmann had for some years previously used materials treated with mercuric bichloride for dressing wounds, and with good results: But the author himself had never used it, neither at Halle, where he first witnessed the immense revolution in

<sup>1</sup> No. 251, Ser. IX., Hft. 11. Feb. 12, 1885.

the treatment of wounds caused by Listerism, nor afterwards in Berlin, where, for a period of five years, he had charge of an extensive surgical department in the City Hospital. He was led to try the efficacy of corrosive sublimate by the unhealthy condition in which he found the Hamburg Hospital, and the insufficient results obtained in treating the wounds in the typical Listerian method. Although he never had known it to fail in his previous experience, he soon found that in Hamburg not only primary union was frequently not obtainable, but even the severer infectious diseases of wounds, erysipelas, septicæmia (with the exception alone of pyæmia), were not to be entirely excluded by this method. Accounting for these facts in the unsanitary surroundings—overcrowded, badly ventilated and insufficiently lighted rooms, with adjoining water-closets, in close proximity to an anatomical institute, and to the wards for infectious surgical diseases and malignant tumors in their advanced stages, etc.—he was led to seek some more potent and reliable method of securing a favorable course of healing of wounds.

At that time iodoform dressings were being warmly recommended. His experiences, however, with this material, he tells us, were anything but encouraging. Not only did erysipelas supervene with unexampled extensiveness and frequency, but several cases of typical embolic pyæmia occurred—a disease which he had not observed since the final adoption of Lister's method several years previously. This, added to the danger of iodoform poisoning, deterred the author from further experiments, and he turned his thoughts to corrosive sublimate, to which, at that time, attention had just been again called by R. Koch, of Berlin, as a most powerful disinfectant. The success of this modification of Lister's dressing has been reported three years ago by a former assistant of the author's, Dr. Kümmell;<sup>1</sup> but since then it has continued unabated, and has given the author good cause to be satisfied with it,—and in this monograph he gives in detail certain particulars which are of interest in the question of sublimate dressings.

Not only did all erysipelatous and other infectious diseases of wounds disappear on the same day that bichloride dressings were introduced,

<sup>1</sup> *Arch. f. klin. Chirg.*, Bd. 28, Hft. 3. *Annals of Anatomy and Surgery*, Vol. VIII., p. 87.

but all wounds, generally speaking, remained entirely free from irritation during the process of healing, and took an ideal course in every way.

The improved arrangement of the internal reorganization of the hospital also contributed to the successful treatment of wounds, and consisted for the most part in the isolation of all infectious diseases, and in giving to the assistant surgeons a greater scope and independence.

The technical details of the present manner of applying antiseptic precautions are as follows: A solution of 1 in 1,000 corrosive sublimate is used for disinfecting the hands of the operators, the skin of the patient, the sponges, and for such wounds as have existed before admission. The weaker solution of 1 in 5,000 is used for irrigation of fresh wounds during operation. In operating upon unhealthy surfaces, both solutions are used alternately for irrigation. The reason for not using the stronger solution altogether for irrigation consists in the danger of poisoning.

Turf-moss is generally used as a dressing, and is preferred to sand or ashes, and also to wood-wool, which is liable to pack and leave free interstices. This moss, having previously been picked over, is prepared by submersion in a solution of corrosive sublimate 1 in 500 for several hours, and is then wrung out and sewed, in a moist condition, into bags of sublimated gauze, so that cushions are formed, of about 2 centimetres in thickness, but differing in length and width, the largest being 54 by 70 centimetres.

Only enough of these cushions are made for use during the day, and they are kept in air-tight envelopes in a wooden box lined with glass plates. Dry cushions require to be wrung out in sublimate solution before use. Sublimated cotton and gauze are also used for certain purposes, and are made by immersion during a few minutes in a solution consisting of 1 part of corrosive sublimate, 10 parts of glycerine, and 190 parts of water.

Glass-wool is also extensively used, this being a conglomeration of finest spun glass threads, soft and pliable as silk; this is kept in a one-per cent solution of sublimate till used.

Sublimated catgut is now prepared by winding the catgut tightly around thick wooden spools, and placing them from six to twelve



hours, according to thickness, in a one-pro-mille solution of mercuric bichloride, and afterwards keeping it in absolute alcohol.

The dressings are applied in the following manner:

After closing the wound with sutures, a thin layer of moist glass-wool is covered over it, upon which the moss bags are laid, varying in size and number according to circumstances, the object being to adapt the surfaces of the wound to be united, exactly, and to exercise a pressure upon it. For this latter purpose, bandages cut from sublimated gauze are often used between each cushion. The whole is then finally enveloped in one large cushion, which is securely fastened in its place by simple gauze bandages, to which a moistened starched bandage is added.

Open wounds are either packed with sublimated crushed gauze—or even filled with sublimated sand,—or simply covered with a two or four-fold layer of sublimated gauze, and then bound up with the cushions.

The characteristic feature of all these dressings lies in the fact that they are dry, and favor the exsiccation of the wound. Nowhere is any use made of oil-silk, mackintosh, or guttapercha tissue. The author, indeed, is of opinion that the addition of an impermeable structure, far from enabling the surgeon to leave the dressings on longer, has the contrary effect, not only preventing the evaporation of the secretions as well as the transpiration, but directly increasing the secretions from the wound by keeping it warm and moist. The moss covering, on the other hand, assists evaporation by causing every drop secreted to spread over a comparatively large surface. The secretions thus become inspissated, and the dressings of the larger wounds consequently remain dry for a longer period of time, while the smaller wounds soon cease to discharge, and heal under the coagulum formed by the dried-up exudates. He believes that the use of protective retards primary union, and also increases the liability of infection by keeping the thin layer of substance between the edges of the sutured wounds moist.

The action of the glass-wool is peculiarly efficient by virtue of its capillary suction-power, rapidly distributing each drop of serous secretion to the moss, and thus causing the discharge to cease by drying it up. The wool then forms a compact crust upon the wound, acting

mechanically as a protection to it, and serving as a defense against infection from without.

The author makes free use of rubber drainage tubes, which he prefers to all others, and generally removes them altogether at the first change of dressings on the seventh day, unless any traces of suppuration are to be found in them.

The general course of the healing process is always the same: reaction of any kind may be absent, or an "aseptic" fever may set in, reaching its highest elevation on the second day and disappearing on the third; it may rise as high as  $39^{\circ}$  C.

As to the treatment of infected wounds with corrosive sublimate, the author is in the habit of disinfecting large wounds and suppurating cavities (sacs and empyema) with a solution of mercuric bichloride, 1 in 1,000, and prefers its use to carbolic acid both on account of its efficiency and in regard to the dangers of poisoning.

The severer infectious diseases of wounds, as diphtheritic inflammation and hospital gangrene, may frequently be dressed with advantage with stronger solutions—as 1 per cent. The poisoning that ensued in the only case of the author's, he regards as comparatively harmless.

Compresses, moistened with a one-pro-mille solution of bichloride and covered with rubber tissue, are extensively used at the Hamburg Hospital for covering all unclean, infected or inflamed wounds, and on contused wounds where extensive sloughing is expected, as well as on wounds which are exposed to contamination from fecal matter, and in all chronic granulating surfaces and fistules, especially in tuberculous affections, for which the author regards corrosive sublimate as a specific.

All these latter uses of the antiseptic, including the cases where certain amounts of the liquid were allowed to remain in cavities of the body, or when the one-pro-mille solution was used for a very great length of time during an operation on anæmic subjects or in serous cavities,—the author considers not free from the danger of poisoning with which subject he concludes the memoir—although he never had but one occasion to observe intoxications of any great severity, such as have for instance been published by obstetricians. This one case was that of an aged, anæmic and cachectic patient who had been operated for cancer of the breast, and who had suffered from slight

stomatitis, diarrhœa and tenesmus after the operation, and had recovered; on the seventh day, however, the wound was again dressed and irrigated with the one-in-thousand solution; immediately after which the symptoms reappeared and the patient died—nine days later, although the dressings were speedily removed.

Regarding a series of cases (8) treated with sublimate-compresses for septic diseases, which had presented no symptoms of poisoning during life, but which showed morbid intestinal changes very similar to those found in cases of mercuric poisoning after death (consisting of catarrh and superficial ulceration of the mucous lining of the rectum, reaching as far up as the ileum; croupous exudates and diphtheritic membranes with injection and thickening of the mucous membrane), the author is in doubt whether to class them simply as septic intestinal disease or as intoxicants, and adduces a number of similar cases (4) where the post-mortem revealed the same conditions, but which never had been treated with mercury.

He believes septic diseases and diphtheria tend to affect the digestive tract, and that the use of corrosive sublimate as a surgical dressing may increase this tendency. Clinical symptoms of mercuric poisoning, tenesmus, mucous and bloody dejecta, were not present in any of these cases.

As a final result of his experiences, the author asserts that whoever makes use of corrosive sublimate as a surgical dressing with the necessary precautions, will find it not only the most reliable and efficient disinfectant, but one that will promote the rapid healing of wounds more than any other, and is at the same time more free from disagreeable or dangerous secondary effects than any other.

Appended is a survey of the results of nearly 1,300 operations performed at the Hamburg Clinic for the thirty months during which corrosive sublimate was used, and ending the 1st August, 1884.

W. VAN ARSDALE.

## INDEX OF SURGICAL PROGRESS.

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### Ulcers, Abscesses, Tumors.

I. PERFORATING ULCER OF FOOT. Mr. PEPPER. At a meeting of the Pathological Society of London, October 21, 1884, Mr. Pepper presented specimens from a patient with perforating ulcer of the foot and tabes dorsalis. The disease began with a corn on sole of right foot, followed by acute inflammation of skin over dorsum of foot, going on to gangrene. Amputation was performed, but sloughing took place in the stump, and she died. (She exhibited also plantar anaesthesia, absence of knee-jerk, and double ptosis. Gait not ataxic.) At post mortem Dr. Silcock found grey degeneration of the posterior root zone. Microscopically, the whole cord was found affected with diffuse sclerosis. Thickening of neuroglia, especially round grey matter of post. cornua. Post. cornua and roots also involved. Blood-vessels of cord thickened. No normal nerve fibres in post. root zones were seen. There was evidence of hyperplasia of the endo- and epineurium of the sciatic and sub-popliteal nerves, and the axis cylinders were much altered. Dr. S. concluded that the trophic lesions which occur in cases of locomotor ataxy were attributable to structural alteration of the peripheral nerves, rather than to changes in the spinal cord.

Dr. Buzzard suggested that possibly the neural changes might depend on the thickened condition of the vessels of the periphery of the arterial system.

J. E. HINE (Oxford.)

II. DU CANCER PRIMITIF DES GANGLIONS. Par M. PERRET. The author gives the details of two cases of malignant tumor originating in lymphatic glands, of which the following are some of the chief facts: A miner, aged 33, was admitted into hospital, and died on the following day. Two years before, he noticed an enlargement of the glands of the left side of the neck, accompanied by some pain. The condition remained stationary for some months, and it was not until the end of the year that the glands took a more considerable development. From that time he became rapidly emaciated; and increasing cachexia, with oedema of the left arm and lower extremities, and dyspnoea, terminated in death.

*Autopsy.* The glands on both sides of the neck, especially on the left, of the axilla, mediastina, and abdomen, formed large bossed masses of a whitish color, the centres of the masses being diffuent. The enlarged glands were adherent, but could be isolated with difficulty. The lungs contained a few whitish nodules. There was serous effusion into the right pleura, and the inferior vena cava was com-

pressed. The liver was normal and enlarged. No increase of the white corpuscles of the blood was observed.

Examination with the microscope showed in the diffluent central portion of the glands masses of clear, nucleated cells three or four times larger than leucocytes, apparently situated in a cavity. In the firmer peripheral portions were distinct alveoli, chiefly elongated, and filled with similar cells.

The author concludes, from the histology and clinical history, that the case was one of true carcinoma of the lymphatic glands, beginning primarily in the glands of the neck.

Since Rokitanski indicated, in 1842, the possibility of primary cancer of the lymphatic glands, only four authentic cases have been published,—a circumstance attributable to the extreme rarity of the disease, and also in part to the confusion existing in regard to the pathology of lymph-gland tumors. A short review of the recorded cases of the disease is added.

[NOTE. The correctness of classifying these tumors as carcinomata, and of the rarity of the disease, is open to question. Many pathologists, in consideration of the origin of the tumor from connective tissue, and not from epithelial elements, would prefer to term it a lympho-sarcoma having an alveolar arrangement; and I venture to think that descriptions of many such tumors may be found under the heading of lympho-sarcoma. It would be of interest to know the nature of the mine in which the patient worked, as the liability to lympho-sarcoma of workers in cobalt mines is well authenticated.—F. S. E.]

The second case, related in contrast to the preceding, is that of a man, aged 57, who died with lymphadenoma. A year and a half before his death he was attacked with intense diarrhoea of several days' duration, and then noticed that his abdomen began to enlarge, and nearly at the same time he observed painful glands in different regions of the body. His abdomen became much enlarged, and palpation revealed in its median part a number of little tumors varying in size from a walnut to a fowl's egg, and the superficially placed lymphatic glands were enlarged and either discrete or conglomerate. From that time he failed rapidly and gradually lost strength. Death took place with asphyxia, the fatal termination being preceded by an effusion into the left pleura, which was several times evacuated by puncture; the fluid contained numerous red blood corpuscles. On the day before his death, the patient, in getting out of bed, slipped upon the floor, and sustained a fracture of the shaft of each femur. Examination of the blood, practiced on two occasions, showed no increase of the white corpuscles.

*Autopsy.*—The right pleural cavity contained a large amount of sanguinolent fluid; the left, which had been tapped, contained a small amount; lungs, liver and spleen normal.

The abdominal cavity contained serous fluid, and was nearly filled by an irregular bossed tumour of soft consistence, which occupied the mesentery; it consisted of a multitude of nodules, mostly of the size of a walnut, showing in section a pale,

firmer peripheral part, enclosing a softer yellow central part. Similar tumours were scattered throughout the omentum.

The tracheal and bronchial glands were enlarged. The fractures of the femur were extensively comminuted. The walls of the bones were very thin, pliable, and could be cut with a scalpel. The medullary cavity was filled with an abundant marrow of a rosy-grey colour.

The remainder of the skeleton could not be examined. Examination with the microscope showed that the abdominal tumour was constituted by an agglomeration of glands, consisting of ordinary reticular tissue, with numerous lymphatic cells in the meshes—that is to say, a lymphadenoma. The enlarged lymph-glands elsewhere had the same structure.

The liver contained some islets of reticular tissue. The lungs were normal. The spleen was not examined.

In the medulla of the bones was found a considerable production of reticular tissue, containing a great number of small cells, a very few giant cells, and little or no fat.

The author comments on the rarity of pleural effusion in lymphadenoma, it having been found only eight times among 90 cases in the statistics of Vidal and Ollivier.

In consideration of the slight force with which the fracture was produced, it may merit the name of a spontaneous fracture.

Among the hypotheses put forward to account for the difference in the blood in leucocythemia and lymphadenoma, is one, in which, having in view the blood forming properties ascribed to the medulla, assumes that the marrow of the bones is altered in the former and not in the latter. The fallacy of this is proved by the case related and by four others previously recorded.—*Lyon Médicale*. 1885. January 4 and 11.

III. TREATMENT OF CANCER IN THE FEMALE BREAST. By Mr. OLIVER PEMBERTON. The author lays down the following rules with regard to operation: He would recommend it "where the tumour was increasing, provided that, (a) the entire breast was not infiltrated, and that there existed an appreciable line between the deposit of cancer and the healthy breast, and that the parts were not adherent to those below. (b) That the neighbouring glands were not affected by the spread of the cancerous material. (c) Where the skin was neither thickened, nor brawny, or tuberculated."

He would not operate after the age of 55, "except where severe pain as well as hemorrhage attend on open cancer, and the parts admit of healing by clean skin." In elderly women, beyond 55 years of age, the rate of progress of the disease is much slower, constitutional infection is less rapid, and the disease is often of the form termed atrophic or retracting scirrhus, which increases slowly or remains stationary. This form should never be subjected to operation, for, when operated on, such cases are speedily followed by symptoms of cancerous deposits in the internal organs, leading to cachexia and death.

The author strongly advises the complete removal of the indurations of the breast,

commonly appearing in the child-bearing period, between 35 and 45.—*Birmingham Medical Review*. 1885. January. F. S. EVE (London).

IV. HYDATID CYST OF THE PAROTID GLAND AND OF THE MAMMARY GLAND. By Dr. ADOLFO LUIGI (Florence). *Hydatid of the Parotid*. Male, 39 years of age, of robust general health, presented a superficial cystic tumour in the parotid space on one side. The tumour has a history of less than six months, and is steadily increasing in size. An exploratory puncture for purposes of diagnosis was followed by wide spread acute cellulitis. A free incision being made on the following day, a smooth white cyst shelled out, of pearly appearance and delicate texture. The contents of the cyst were alkaline, non-albuminous, and microscopical examination was negative in its results.

*Hydatid of the Breast*. Female, 25 years of age; seat of tumour, right breast; duration, eighteen months; size, hen's egg; freely movable under the skin, and apparently imbedded in the mammary gland. It was easily enucleated and removed entire through an incision in the overlying skin. The contents of the cyst were a clear liquid, containing pathognomonic hooklets and scolices.

The reporter observes that hydatid cysts are among the most rare diseases that attack the mammary organs; that they seldom attain any great size, and that in the majority of cases they display a hardness that is suggestive of a malignant growth. There is no part of the human body, not excepting the bones, that has not been the seat of hydatid growths.

Hausmann (*Die Parasiten der Brustdrüsen*, Berlin, 1874) has recorded 16 cases of hydatid cyst of the mammary glands. Giuseppe Frey (*Beitrag zur Lehre von Tenia Echinococcus*. Inaug. Diss., Berlin, 1882) in giving an account of an hydatid cyst in the skin over the roof of the orbit, records the statistics of 780 cases that had been collected by him. His figures show 47 per cent. of cases in the liver and the rest in different parts of the body. From this it will be observed how frequently hydatid cysts develop themselves in the liver. These cases, because common, are seldom recorded, and it is therefore safe to surmise that the percentage of cases of hydatids of the liver which actually occur is even greater than that recorded above. The reporter has not been able to find any detailed description of an hydatid cyst in the parotid, published. Klebs (*Handbuch über der pathologischen Anatomie, Erste Lieferung*, S. 150, 1868) says that parasites are rarely found in the salivary glands, and that an hydatid cyst in the parotid has only once been met with. O. Webber (*V. Pitha Billroth*, Bd. III, S. Abth. 2, Heft. S. 390), speaking of cysts in the parotid, says: There is only one case described by Pale. In this instance the tumour weighed 10 lbs. and inclosed cysts, which in themselves contained others; but he was unable to make an examination to confirm his diagnosis.—*Lo Sperimentale*. 1885. January 1.

PIETRO MICIELLI and H. P. DUNN (London).

## Bones, Joints, Orthopædic.

I. ON THE SURGERY OF THE EPIPHYSES. By Mr. WHEELHOUSE (Leeds). Comments on the importance of a knowledge of the anatomical relations and periods of

junction of the epiphyses of the long bones, and on the necessity for care in the diagnosis and caution in the prognosis of injuries affecting these parts in young subjects.

Injured epiphyses are prone to inflammation, going on frequently to suppuration, periostitis, and even osteomyelitis. A large proportion of cases of hip-joint disease are due rather to traumatic than constitutional causes. Inflammatory action, starting at the epiphysis, may result in periostitis, affecting the whole shaft and causing partial or complete necrosis. The arrangement by which the long bones grow and receive nourishment in sections, namely, a diaphysis and epiphyses, permits of the death of one portion without completely checking the development or destroying the function of the bone.

Quoted and apparently endorses Dr. Smith of Dublin's opinion, that in the case of the lower end of the humerus, separation of the epiphysis involves only the trochlea and capitellum, the condyles remaining attached to the shaft.

An occasional complication of separation of the epiphyses is compression or obstruction of the main vessels of the limb, leading to gangrene, and rendering amputation necessary. Mentions two cases in which this resulted from separation of the lower epiphyses of the femur.—*Brit. Med. Journal*. 1885. March 7.

T. DUNN (Glasgow).

II. TEMPERATURE OF THE BLOOD ATTENDING SIMPLE FRACTURES. By Dr. GRASSIE. The author, in a preliminary report to the Vienna Society of Physicians on the elevation of temperature in subcutaneous fractures, states that in one-half the clinical cases he found  $38^{\circ}$ , in the other half  $39^{\circ}$ ; once  $39.7^{\circ}$ . In outside patients the axillary temperature never exceeded  $37.8^{\circ}$ ; in one case of humerus fracture no elevation. Moreover, in young persons he found an increase of indican in urine within 2 days—the larger the bone fractured the more indican. In older persons the increase appears later. Volume of exudation bears no relation to occurrence of indican. In operations on bones an increase of indican always occurs—often not until 8 or 10 days. Since indican appears in various other troubles, phthisis, invagination, cholera, spinal troubles, it cannot be utilized to diagnose a fracture; but its absence disproves a fracture or any process in the bones.—*Wien Med. Woch.* 1885. May 16. No. 20.

W. BROWNING (Brooklyn).

III. FRACTURES OF HYOID AND OF LARYNX. By MR. ARBUTHNOT LANE. This paper is of interest as proving these injuries, both more frequent in occurrence and less serious in results than is usually supposed. Mr. Lane quotes Fischer and Durham's statistics, which show a mortality of two thirds of all cases, while on the other hand, he had himself, in examining 100 bodies in the dissecting-room, found fracture of hyoid or larynx in 9 cases, in none of which death had been due to the injury. In 8 of the cases there was fracture of the upper cornua of the thyroid.

Cricoid fracture is by far the most dangerous variety. Fracture of upper cornua of thyroid is easily produced by compression and backward pressure. The cartilage breaks more readily in late adult life than after ossification in old age.



In subsequent discussion, most of the speakers dissented from Mr. Lane's conclusions; but a committee appointed to examine the specimens produced, reported that these fully confirmed the views advanced in the paper.—*Proceedings London Pathological Society. Lancet. 1885. March 7.* THOMAS DUNN (Glasgow).

IV. FRACTURES OF THE ULNA BY INDIRECT FORCE, AND FRACTURE OF THE RADIUS BY TWISTING. By Dr. F. BROSSARD (Lyons). In a volume of 120 pages, published by J. B. Baillière and Son (Paris), the author details clinical facts, and experiments on the cadaver, from which he draws the following conclusions:

Fracture of the ulna by indirect force, scarcely mentioned by some authors, is a lesion of childhood and adolescence—the reason for its occurrence at this age being found in the constitution of the bones at these periods of life, and the relative ability to resist strain exhibited by the osseous tissue and articular ligaments. This solution of continuity may result from two causes—vertical force or twisting. It results from vertical force when, in general adduction of the limb, the ulnar inclination of the hand makes the ulna the agent of transmission to the carpus of the pressure which it receives; from twisting when, by an exaggerated supination, the posterior surfaces of the two bones of the forearm come in contact, and by this contact a force of flexion from before backward is impressed on the ulna.

The seat and form of the fracture vary according to these two mechanisms, and, also, in a very notable degree, according to the ages of the persons injured.

The common characteristic of these solutions of continuity is to be incomplete and subperiosteal; this latter diagnostic point is the only one which can be determined during life.

Since the absence of deformity of the limb and of mobility of the fragments renders these fractures liable to be confounded with osseous contusions the error is to be avoided by careful study of the producing cause, by the important symptom of a limited swelling, and by the pain, the fixed locality of which can be explained by no other cause.

This overlooked lesion may be the point of departure of grave inflammatory accidents. It is important, therefore, that it be recognized, and that it be treated by immobilization, which generally will suffice to accomplish a cure.

A twist in exaggerated pronation may determine in the radius a fracture, hitherto undescribed. It takes the form of a fissure, whose track may be spiral. This fissure is often accompanied by incomplete transverse fracture, and sometimes with tearing away of the lower epiphysis.

V. TRANSVERSE FRACTURE OF THE PATELLA; ASPIRATION OF THE JOINT; SUPPURATION; ANTISEPTIC INCISIONS INTO THE JOINT; SUBSEQUENT WIRING OF THE FRAGMENTS; RECOVERY. By Mr. RIVINGTON. On admission, December 29, 1883, there was much effusion, and a back splint and ice bag were applied; 31st, attempt to approximate fragments by strapping; January 11, joint tapped antiseptically with trocar and canula, only two ounces of blood and serum removed, antiseptic dressing and ice; 16th, attempt to approximate fragments by Malgaigne's

hooks inserted into strapping and gutta percha, had to be removed; 23d, pus oozing from aspirator puncture, joint freely opened and washed out antiseptically; 30th, antiseptic suture of patella; March 7, antiseptics discontinued; March 10, wounds healed. Result when discharged, bony union; but very little movement. No attempt made to break down adhesions.

The interval between the opening of the joint and the suture of patella was to prevent bringing discredit upon the operation in case sepsis had already occurred.—

*Lancet.* 1885. January 24.

B. WAINEWRIGHT (London).

VI. DISLOCATION OF THE FIFTH CERVICAL VERTEBRA; REDUCTION; RECOVERY. By GUIDO THOM, M.D. Patient fell from a wagon, the wheel passing over him. Symptoms observed—paralysis of right side and of left arm; deviation of uvula to right; dilatation of left pupil; difficulty of breathing, apparently from paralysis of respiratory muscles; marked prominence of 6th cervical vertebra.

Reduction of the dislocation by extension and manipulation produced immediate improvement in breathing, but no change in other symptoms. Paralysis slowly improved, leaving, after six months, only a slight limp. [The case seems to have been complicated by cerebral compression, probably from hæmorrhage at base. T. D.]—*Austral. Med. Gaz.* 1885. January.

VII. COMPOUND DISLOCATION OF ELBOW-JOINT, WITH DIVISION OF MAIN ARTERY AND VEIN. By MR. RUSHTON PARKER. Patient, a female, intemperate, fell down stairs; sustained dislocation of elbow; the humerus, stripped of muscles for lower 3 inches, protruding through wound 4 inches long in front of joint; main vessels torn across. The wound was cleansed with carbolic solution, the dislocation reduced, the vessels tied with catgut, the arm wrapped in a gauze dressing, and the elbow fixed in acute flexion, no splint being used. No drainage tube inserted. Wound dressed daily for five days. No pus formed, and healing was complete in four weeks. No movement of joint permitted till after four weeks. A perfectly useful joint resulted. Success due to prompt disinfection of wound, absence of sutures, free opening in skin preventing tension, position of acute flexion (which is superior to splint), and disuse of passive motion, in itself a frequent cause of inflammatory mischief.—*Lancet.* 1885. March 14.

T. DUNN (Glasgow).

VIII. ON THE POSTURES OF INFLAMED JOINTS. By Prof. LÜCKE (Strassburg). The theory of Bonnet still holds good as applied to acute inflammation of joints; that the position is adopted in which the capsule of the joint can hold the largest quantity of fluid—namely, a flexed position. The author, however, calls attention to the fact that the amount of the effusion may not correspond with the degree of flexion. Moreover, effusion of a non-inflammatory nature, such as hæmorrhage due to traumatism, and especially in cases of hæmophilia, caused only a very slight flexion of the joint. In these cases inflammatory irritation was wanting, the capsule was less yielding, and muscular action came into play. In acute serous synovitis, too, as in poly-articular rheumatism, or uratic diathesis, no corresponding posture was adopted. In these

cases the patient was muscular and energetic, while in nervous or delicate individuals the flexed position was excessive.

In cases of chronic inflammation, Bonnet's theory never could be applied, owing to the gradual distension of the capsule and the absence of inflammatory irritation. What change there was in these cases was due to the yielding of the ligaments, and to destructive processes, as was also the case in arthritis deformans.

In cases of chronic granulating or tuberculous synovitis, and in cases where the epiphyses were primarily affected, Bonnet's theory had only been very restrictedly applied.

Generally speaking, there was a tendency to attribute the position of the joint to the option of the patient, or to a certain adaptation of means to ends, since that posture was adopted which admitted of the relatively easiest and most painless use of the limb.

The painlessness at the commencement of chronic inflammation of joints, in the opinion of the author, allows of a more protracted use of the limb. The positions found are, therefore, dependent in these cases on muscular conditions.

Prof. E. Fischer found that the flexor muscles in all extremities were more advantageously supplied with blood vessels than the extensors. Grützner showed that the histological structure differed in the extensors and flexors. It is also known that the impairment of motor function, due to fatigue after electric stimuli, is greater in the extensors than in their antagonists.

Clinically and pathologically analogous facts have been observed by Sonnenburg and Lücke: the extensor muscles become atrophied earlier than the flexors; they react with less energy, are of lighter color and more anæmic. In like manner voluntary movements are impaired.

In cases of chronic gonitis we observe an angular position of the joint, combined with a relaxation of the quadriceps. But which symptom is the primary one? In answer to this question, the author infers: (*a*) either the muscle is atrophied from inactivity, owing to the infiltration of the intra-articular ligaments and the congestion of the capsule—since the extension of the capsule by fluids is slight at first—it may, however, be objected that the extensors are still used at first; (*b*) or else some other unknown cause is at work, some reflex disorder of the vasomotor nerves; (*c*) or else the contracture of the flexors is the primary cause, resulting from the inflammatory irritation in the joint. This theory is, however, without sufficient foundation.

The author himself believes that in chronic granulating joint disease, the flexed position is induced by the irritation due to the inflammation, as in that posture the least amount of pain is incurred; if the patient now attempts to walk, he naturally contracts all the muscles, so as to avoid any movement (which would cause pain). This contracted state of the muscles, however, tends still to heighten the degree of flexion, as the flexors are naturally, and anatomically, stronger and less easily fatigued than the extensors. Therefore, the longer this flexed position has been

maintained, the more marked it becomes, as is the case in paralysis originating in the nervous centres. Ankylosis, as well as continued recumbent posture, prevents such contractures from becoming exaggerated.

The atrophied state of the extensor muscles, which never again can be wholly repaired, renders it difficult to attain good results after forcible extension and after excisions of the joints. In hip joints it is especially the adductors, in the shoulder the pectoralis major, that are difficult to contend with.

The author therefore concludes that in chronic joint disease the posture of the joint is adopted voluntarily or from expediency, so as to facilitate the use of the limb, in the same manner as scolio-lordosis is adopted to compensate adduction, disappearing when the patient is confined to his bed, as its only purpose is the avoidance of limping. In the knee joint a valgus position frequently results from walking with the heel raised, which is facilitated by an external rotation at the knee.

In the elbow, the weight of the forearm compensates the tendency to contracture, as does also the fact that in pronation, which is the natural position of the forearm, the flexors do not exert as much force as they do when the arm is supinated.

The posture is further influenced by the destruction of parts of the joints; adduction in the hip joint, for instance, is caused by destruction of the acetabulum, as the varus position of the knee is due to destructive changes affecting the internal condyle of the femur or tibia.—*Deutsche Zeitschrift für Chirurgie*. Vol. 21. 5. Mar. 9, 1885.

IX. ACUTE OSTEOMYELITIS AFFECTING THE JOINTS. By Dr. W. MÜLLER (of Göttingen). Although the greater part of this paper is taken up with sketches of cases, it possesses unusual interest, due not only to the fact that a new and important aspect of the subject is introduced, but also to the very able, concise literary review of the subject with which the author commences his treatise.

Arguing from analogy, and from the very generally known and accepted fact that tuberculous joint disease is usually caused by the perforation of an osseous focus, situated in the epiphysis of the bone, into a joint cavity, the author asserts that osteomyelitic affections of joints originate in the same manner, although this fact is comparatively little known and appreciated. On this account, and from clinical and therapeutical reasons, it is desirable to separate the diffuse form of osteo-myelitis, which attacks chiefly the diaphyses of bones, from these joint-affections. Twenty years ago Volkmann, and subsequently Demme, spoke of such joint-disease occurring after foci in the epiphyses, while most writers only allude to joint-affections associated with disease of the diaphyses. Roser, on the other hand, believed that joint-disease could occur independently and separately from necrosis of the bone ("pseudo rheumatic" coxitis, etc.), or even that the bone could become secondarily affected by the joint-trouble. Lücke, who first characterized osteo-myelitis as an infectious disease, mentions these isolated foci, but does not distinguish them from the diffuse form. Schede first makes a distinction between isolated foci in the diaphyses and the diffuse affection of the diaphysis; and Volkmann, as Driessen tells us, distinguishes

between early affections of the joints and those occurring after four or six weeks, which latter ones he believes due to infection from the diseased diaphysis; but he does not mention foci in the epiphysis. Albert alludes to the subject in his treatise on necrosis of diaphyses, believing such a focus easily mistaken for a tuberculous one, and expresses doubt as to the occurrence of primary synovial osteo-myelitic affections. Rosenbach and Kocher observed small foci, even in diffuse disease of the bone-marrow. The author himself concurs in the opinion expressed by Schede, that the foci in the epiphyses should be considered as separate from other ones, but he includes those situated in smaller bones, on account of their proximity to joints.

He then proceeds to publish twenty-five cases of joint-affections in osteo-myelitis, which were treated during the last seven years, in the Surgical Clinic in Göttingen. In sixteen of these the hip-joint was affected, in three the knee, the foot in two, the hand in one, and in three cases several joints were simultaneously attacked.

Traumatisms were present in the history of very few cases. The disease commenced suddenly, and usually attacked individuals under eighteen years of age, but having arrived at puberty. Males were more frequently affected than females, in proportion of four to one. The disease commences as an infectious disease, with early localization, the characteristic symptom in these cases being the affection of the joint-regions alone. Speaking of the etiology of the disease, the author touches on the question of micro-organisms, and mentions the specific microbe. Pathological investigation reveals osteo-myelitic foci, exactly similar to tuberculosis, already developed in a few days or weeks, and containing a sequestered piece of bone, which, however, is not always found, it having been absorbed by the granulations covering the walls of the cavity. These small sequestra resemble the tuberculous ones; the latter, however, are dry and present a cheesy infiltration, and are continuous with their surroundings.

The specific osteo-myelitic granulations which line these small cavities, compared with tuberculous ones, are yellower, softer and pulpy; microscopically examined, they contain elements of fatty degeneration and a great number of cocci, from which the characteristic yellow growth may easily be obtained by the aid of culture experiments. They, of course, never contain tubercle. In the cases given the foci described were found quite near to and perforating into the joint. This could the more readily be observed, as the cases were treated by an early incision of the joints and removal of the foci with the chisel.

The author, therefore, is of opinion that the suppuration of such joints is due to the perforation of such foci into them, and firmly believes that all destructive processes of the articular portions of bones are occasioned by such primary osseous foci.

The immediate reaction in the vicinity of such foci may consist in sclerosis, or in rarefaction of the bone.

After perforation into a joint-cavity, the synovial membrane may react by setting up any kind of inflammation; either serous or sero-fibrinous exudate may ensue, or

a granulating synovitis (differing from tuberculosis by the absence of tubercle, and being of a different color), or a purulent one.

After giving more detailed consideration to various joints in turn, the author enumerates the symptoms of the disease, pointing out how it at first simulates an acute joint-affection, but differs in the course it has to run. There are frequently points to be made out that are sensitive on pressure. One may even have the impression of a cavity in the hard tissues.

The acute symptoms usually subside after a period of from three to six weeks. The joint very rarely can be quite restored to health, an ankylosis most generally resulting, or else a chronic state of infirmity ensues when fistulæ are present.

A precise history of the beginning of the disease is of the greatest importance in the diagnosis. An exact local examination is, however, frequently attended only with negative results, except at operation. The prognosis as to the life of the patient is favorable; but the joint affected will remain more or less useless.

As regards treatment, an operation is almost always demanded. Abscesses are, of course, to be opened. Affections of the hips require an excision of the joint, with removal of the focus and of the sequestra, and possibly of the entire membrane of the joint, the prognosis being better than in similar tuberculous affections. For other joints, incisions and partial excisions and drainage will suffice.—*Deutsche Zeitschrift für Chirurgie*. Hft. 5 and 6. 1885. March 9.

W. VAN ARSDALE (New York).

X. EXCISION OF HEAD OF FEMUR IN A CASE OF UNREDUCED SPONTANEOUS DORSAL DISLOCATION, OCCURRING DURING FEVER. By MR. WM. ADAMS. It occurred in a lad, aged 11 years, suffering from rheumatic fever. The limb was contracted and useless, and two unsuccessful attempts at reduction had been made. The head, which was on the dorsum ilii was reached by a T shaped incision. The capsular ligament was ruptured. The neck was sawn through a little below the margin of the the articular cartilage. The limb afterwards was perfectly straight, and the movement of the hip joint was free in all directions. H. H. TAYLOR (London).

XI. THE PATHOLOGY AND ETIOLOGY OF CONGENITAL CLUB-FOOT. By ROBERT WILLIAM PARKER and SAMUEL GEORGE SHATTOCK. This is a contribution to the pathology and etiology of congenital deformities, which is of great interest, and bears witness to the industry and acumen of its authors. They commence with a description of six cases dissected by themselves, and present therewith diagrams illustrating the form of the astragalus in each case, accompanied, for purposes of comparison, with others of the forms of normal astragali in man and the anthropoid apes. Where there was an opportunity of examining the spinal cord, nothing abnormal was found. After removing all the muscles from the legs affected, considerable force was still required to straighten the foot. This resistance, however, disappeared when the ligaments were divided. In a typical case of varus, the following changes were found in the astragalus: Its trochlear surface is extended backwards as far as the posterior edge of the lower articular surface. The extent of this additional surface is still

easily recognizable, and it is clearly due to the condition of extreme extension of the ankle-joint. On the contrary, the extent of the trochlear surface is proportionately lessened in front, owing to the fact that it no longer forms part of the proper articulating surface. In the next place, the neck of the astragalus is lengthened and directed inwards with an unnatural obliquity. "The articular surface of the head is prolonged on its inner side, and instead of being uniformly convex, it is divided into two parts, the planes of which meet at an obtuse angle; the inner and larger corresponds to the displaced navicular bone; the outer portion, which looks forward, is unopposed, instead of being, as in the normal condition, in contact with the navicular. The portions which are redundant, both on the head and on the trochlear surface, correspond in extent with the normal limits, but do not present the polished surface of the rest of the articulating areas, being covered with a layer of loose connective tissue. The internal malleolar facet is unrecognizable, doubtless because it, too, has ceased to form part of the proper articulating area." Case 3 showed a marked amount of rotation inwards of the tibia and fibula. In it, also, band-like adhesions existed between the trochlea and the opposed margins of the tibia and fibula. This was an anencephalous foetus. The 6th case presented one of the bursal cavities, regarded by Volkmann and Lücke as indicative of local, intra-uterine pressure.

The authors next sketch the different theories which have been advanced to account for congenital club-foot. They think that only in a few exceptional cases do nerve lesions play a part in the etiology. They agree with Adams that the bone changes are a result, and not a cause of the mal-position. They confirm Hueter's statement that the axis of the neck of the astragalus at birth is normally directed with a considerable degree of obliquity inwards and forwards. The redundant portion of the articular surface on the head of the astragalus, already referred to as being covered with a layer of loose connective tissue, they regard as "undoubtedly" showing that displacement of the foot has occurred at a period subsequent to the development of an astragalus of normal conformation. In one of the cases, that of an anencephalous foetus, they assert that the astragalus was quite normal—"a fact which argues strongly against mal-formation of the bone as the cause, or even an essential element of the condition." They omit, however, to give any account of the condition of the other bones, except that the "calcaneum was normal." The anatomy of club-foot has not yet been proved to be wholly concerned with the astragalus. The authors afterwards point out that apes are not talipedic, although obliquity of the astragalus is normal in them. They then give a long, ingenious and forcible argument that club-foot and other analogous deformities are caused by intra-uterine pressure. The usual position of the foetus in utero is described. Various specimens of fetuses with club-foot, preserved within their membranes, are referred to, and circumstances noted which suggest a mechanical explanation. It is asserted that other joints are affected in a way strictly identical with clubbing of the feet. The so-called "*genu recurvatum*" is quoted as an example. With regard to heredity, and its being sometimes the father who transmits, they say this does not militate against a mechanical theory of causa-

tion, because it is now known that the liquor amnii is a fetal, and not a maternal product.

In summing up, they say: "Calcaneus, we hold to be an exaggeration by environment of the position natural to the fetal feet during the later period of intra-uterine life, some limitation of extension-movement being normal at the time of birth."

"Varus, we think, results from similar causes, but these commence to act at a much earlier period of intra-uterine existence, the great alterations in form of the bones, which usually co-exist, and the adhesions at times met with in the ankle-joint, pointing to this."—*Reprint from the Transactions of the Pathological Society of London.* 1884.

XII. OBSTINATE CLUB-FOOT TREATED BY DIVISION OF LIGAMENTS; EXCISION OF CUBOID. By MR. C. B. KEETLEY (London). A clinical application of the lessons deducible from the pathological descriptions of Messrs. Parker and Shattock (*vide supra*). In an obstinate case of congenital equino-varus, which had been by no means cured by excision of a wedge, including the cuboid, on April 7, 1885, he made a somewhat curved incision from over the inner malleolus forwards and slightly downwards, along the inner border of the foot as far as the internal cuneiform. Having the abductor pollicis well retracted, the anterior part of the internal lateral ligament of the ankle-joint and the internal scaphoideo-cuneiform ligaments were easily exposed and divided, the corresponding joints being at the same time necessarily opened. The inner part of the calcaneo-scaphoid and the tibialis posticus tendon were at the same time divided.

The effect was most excellent. The foot could immediately be placed in a perfect position with ease. Not only the varus, but the calcaneus disappeared. The full effects of the former excision of the cuboid, which had been hidden by the tension of the ligaments while undivided, at once appeared.

The reason why the really splendid improvement of this case is attributed to the combination of resection with division of ligaments is that, when the bone was removed, it was evident that the tension of the deep structures on the inner side of the foot was preventing the opposite sides of the gap from coming together. Had the operator then been aware of Messrs. Parker and Shattock's observations, he would have cut down on the ligaments at once.

The wound healed by first intention, except at site of drainage tube, which closed a few days later. Perfect position is maintained. Plaster of Paris case.

XIII. OSTEOTOMY AND OSTEOCLASIS. DEMONS (Bordeaux). The author states, as a result of experiments made on the dead subject, that osteoclasia always produces a sub-periosteal fracture. In the living subject he asserts that the results are as good as those of osteotomy. For these reasons he prefers osteoclasia. He acknowledges a little remanent stiffness of the knee joint. He uses the apparatus of Robin.—*French Surgical Congress.* April 6, 1885.

XIV. EXCISION OF THE ANKLE JOINT. J. REVERDIN (Geneva). M. Reverdin's mode of proceeding permits the operator to decide, when he has opened the ankle



joint, to what extent he will remove the parts. His incision extends from the edge of the tendo Achillis forwards almost horizontally beneath the external malleolus as far as the insertion of the peronei. He has invented a light form of forceps with which to seize the astragalus. When that bone has been removed, he examines carefully the parts left, and if he finds it necessary for the complete examination or removal of the disease, divides the tendo Achillis. Or, on the other hand, he can now change the operation into an amputation of the foot with an internal plantar flap.

It is for strumous joint disease that the author adopts this plan. After injuries he proceeds differently, preferring "le procédé à incision jambière."

He reminds us that tuberculosis of the ankle joint begins in the malleoli or in the astragalus.

He has found no inconveniences follow division of the tendo Achillis.—*French Surgical Congress*. April, 1885.

XV. EXCISION OF THE ASTRAGALUS. OLLIER (Lyons). Formerly this distinguished surgeon used, in resecting the ankle joint, to concern himself chiefly with the malleoli, and to regard the astragalus as of comparatively second-rate importance. He now takes the reverse view. He always removes the astragalus. "The astragalus," he says, "is a bone of little vascularity, which, once attacked, is incapable of recovery."

He has done this form of operation twenty-one times. He removes the astragalus, and thus clears the way for examination of the deep parts, etc. If the malleoli are affected, he removes the disease, but he proceeds economically, and always leaves a part of them. Even when the pus comes from the tibia, he removes the astragalus and scrapes the former bone.

After extirpation of the astragalus, the calcaneum mounts into its place between the malleoli. The cavity is soon filled with a plastic, osteo-fibrous mass which permits the restoration of the normal movements, and, although the foot is slightly shortened, its form is preserved perfectly.

Like M. Reverdin, he prefers small forceps with which to seize the astragalus.

The extirpation of the astragalus in good time can do immense benefit, and permit the preservation of useful feet in cases which must have come to amputation, had the surgeon waited too long without interfering. The operation is not serious. Of the last 15 cases, of which some were in a deplorable state of general health, Ollier had not lost one.

The operation should be reserved for children, adolescents, and young people.—*French Surgical Congress*. April, 1885.

XVI. "POSTERIOR TARSALECTOMY" FOR OLD CASES OF TALIPES VARUS. GROSS (Nancy). In two cases M. Gross removed the astragalus, and though the improvement was marked, it was far from perfect. There still remained much incurvation of the inner border of the foot. He had also divided the plantar fascia.

In a third case he removed the astragalus, the external malleolus, the anterior ex-

tremity of the os calcis, and divided the tendo Achillis and the plantar aponeurosis. On the other foot of the same patient he repeated this operation, but left the malleolus. "The child has now for a long time walked and run without fatigue, and its two feet have a form absolutely correct." The author exhibited casts.—*French Surgical Congress*. April 6, 1885.

XVII. COMPLETE "ANTERIOR TARSECTOMY." OLLIER (Lyons). In 1874, at Lille, the author declared himself as preferring irregular and partial operations, supplemented with the use of the actual cautery; but he has now seen reason to change his opinion, and to prefer regular and typical resections.

The peculiarities of tarsal disease are due to the multiplicity of bones and articulations. One is never sure as to the limits of disease in a given case. If one leaves the disease "under a compressing bandage, or some immovable apparatus," to advance, soon will come the necessity for amputation. But it is possible, by operating early, to prevent this progress of disease. It is under such circumstances that Ollier recommends "anterior tarsectomy."

The operation consists of the removal of the scaphoid, cuboid and three cuneiforms. Immediate union is not looked for, but drainage tubes are used freely, and complete cicatrization not expected in less than two or three months at the earliest. The loss of substance is not made good by new bone. Hence, considerable shortening, about an inch and a half, is inevitable. Moreover, there is a tendency to convexity of the sole of the foot from tilting up of the heel, as well as of the toes. Still the functional result is excellent.—*French Congress of Surgery*. 1885. April 6.

C. B. KEETLEY (London).

XVIII. ON THE CAUSE AND CORRECTION OF DEFORMITY WITH ANKYLOSIS, AFTER HIP-JOINT DISEASE. By C. T. POORE, M.D., (New York). In cases of recovery from hip-joint disease, with the joint ankylosed in an unfavorable position for easy locomotion, the real cause for the deformity is flexion and adduction of the limb. Of these two factors, adduction is the most important. When ankylosis at the hip is unavoidable, a certain amount of flexion is desirable. The author fixes as a standard an angle of from  $125^{\circ}$  to  $135^{\circ}$ . In the course of the mechanical treatment of hip-joint disease, particular attention should be paid to the prevention of adduction, and for this purpose all hip-splints should be provided with an abduction screw, by means of which the limb should be kept in a slightly abducted position.

For the correction of adduction, after ankylosis has taken place, a section of the femur below the trochanter minor is advocated, to the exclusion of *brisement forcé*, osteoclasis, or osteotomy through the neck, or between the trochanters. In the performance of the operation, care is to be taken that the section is made at right angles to the long axis of the femur, without reference to the pelvis. Before removing from the operating table, a long splint, extending from ankle to axilla, is to be applied. After removal to bed, extension by weights sufficient to steady the limb—this to be increased, after the third day, to the degree required to stretch contracted muscles and adhesions. After this has been accomplished, the limb may be placed

and kept in any required position. Under no circumstance is the patient to be allowed to sit up in bed, until after consolidation has taken place. The position of the limb as to adduction must be constantly guarded against. Plaster of Paris splints are inefficient and to be rejected.—*N. Y. Med. Jour.* 1885. May 16.

XIX. ANKYLOSIS OF BOTH HIP-JOINTS; RESECTION OF HEAD OF RIGHT FEMUR AND OSTEOTOMY OF NECK OF LEFT FEMUR, IN THE SAME PERSON. By Dr. MORDHORST. Man of 24 years. In his 9th year, coxitis on the left from a fall. Suppuration, and later ankylosis. At present an ankylosed subluxation of left caput femoris forwards, with leg much adducted and flexed. Also, ankylosis of right hip, believed to have resulted from non-use. Right thigh adducted, flexed, and rotated inwards. Walking was very difficult.

v. Langenbeck chiselled through neck of right femur, and resected its head. Extension. Primary union. Simple osteotomy in left side—3 weeks after right. Incision on anterior aspect, external to crural nerve. Cicatricial bands formed a great impediment. Also a primary. After each operation, drainage for one day, when the tubes were removed and the wound completely sewed up. (Kocher's method.) Bismuth (2 per cent.) was used on the wounds. Prolonged vomiting, circumscribed inflammation of lip or tonsil, and signs of desquamative nephritis followed in one or both cases—also described by Kocher as occurring after such use of bismuth. Passive motion begun some 4 weeks after each operation. The muscles, out of use nearly 15 years, were much atrophied, but improved fast from motion and faradization. Attempts at standing and walking begun 2 months after second operation. Position of legs normal. Rapid improvement of mobility of new-formed joints, up to flexion of 45°. Can walk well with stick, and stand easily without support. The osteotomy gave a better result than the resection.—*Arch. f. klin. Chirg.* 1884. Bd. 31. Hft. III.

XX. RESECTION OF BOTH HIP-JOINTS FOR ANKYLOSIS. By Prof. N. STUDENSKY (Kasan). Peasant girl of 21 years. Her history points to an inflammation of both hip-joints 14 years before, despite which she was made to scrub floors. This caused the thighs to ankylose straight out on each side and at right angles to the trunk. Joints below hip all right. Musculature of lower extremities and even seat atrophic. Walking performed with rocking motion of trunk. Height, 115 cm. Only one other completely similar case found (Busch in *Langb. Arch.*, Bd. IV).

Resection of neck of femur, June 18, 1883. Cut down through angle made by limb with trunk, where the soft parts proved to be 10 cm. thick. Removal of a wedge of bone from neck of femur, and fracture of the remaining bridge. The end of the femur was then pushed out through wound, cut straight across between the trochanters, and rounded. Want of room and instruments prevented Volkmann's method of re-forming the acetabulum. Extension for a month. Passive motion began at end of 2 months. Exercise and electricity greatly improved muscles. On using the leg, the end of femur gradually glided above the acetabulum to the outer surface of the ileum.

Left hip operated a year after right. Incision on inner anterior surface, necessi-

tating ligation of art. pud. ext. and art. circumflex. fem. int. Here the soft parts were but  $2\frac{1}{2}$  cm. thick. This time a socket was chiselled out. Passive motion after 2 weeks. After 2 months, began walking, and after 4, needed only a stick. The left femur did not slip, so that this side remained 2 cm. longer than the right, and had better motion. Her height was now 130 cm. Two accompanying illustrations.—*Centh. f. Chirg.* 1885. No. 15.

XXI. OSTEOTOMY AND RESECTION OF FEMUR IN BILATERAL ANKYLOSIS OF THE HIP-JOINT. By R. VOLKMANN (Halle). A powerfully built man of 22 years, had had repeated attacks of articular rheumatism, leading to synostosis of hip, knee and ankle joints and both sides. His hips were flexed to a right angle, and knees to an acute angle, while the feet were in equinus positions—the one strongly pronated, the other supinated. He had lain 5 years in bed, unable to stand or sit, or even lie on his back, or turn over. Subtrochanteric osteotomy on right hip, and chisel resection on left, resection of both knees, forced osteoclasia of both ankles; and metatarsal amputation on right foot enabled him to regain a certain independence, sit on a low chair, lie on his back, and get about with a stick. According to V.'s experience, if, in attempting to stretch a stiff joint, the muscles show no contraction, it is a pretty sure sign of bony union.

*Brisement forcé* of the right foot, without injury to the skin, led to suppuration and a serious general condition. V. says some similar cases have taught him that after acute infectious diseases, as acute articular rheumatism and acute osteomyelitis, extensive subcutaneous injury, in regions where disease germs evidently still remain, may prove very dangerous, lead to relapses and fresh inflammation.

*Brisement forcé* of a contracted knee following osteomyelitis, even years after it has healed and where no fistula remains, may bring on a typical relapse; or after acute rheumatism with relapse, it may cause suppuration of the joint. Such germs are, however, entirely amenable to antisepsis—hence, an open wound is preferable. The above case healed speedily under drainage, etc. Six months later subtrochanteric osteotomy, with removal of a wide of wedge bone and resection of knee on right, at one sitting. The limb could be fully extended. Primary intention in 10 days. While transporting the patient to bed the left femur broke—so brittle and atrophic had it become. It, however, consolidated very rapidly under plaster. Five months later metatarsal amputation on right, on account of distorted toes, and a year after this, resection of left hip. Femur was chiselled through just below tip of trochanter. Extreme adduction of leg, so that neck and head of femur could be removed with chisel, and the old socket nicely formed again. Extension from knee and thigh, the leg passing down through an opening in the mattress. Excessive œdema developed in the hanging leg, and only slowly disappeared. Here also primary union. Five months later, resection of left knee. Patient thus gained a firm, straight right leg and mobility in left hip. Volkmann has performed osteotomy and chisel resection with restoration of hip-socket 29 times, with success in each case. Chisel resection and restoration of the socket is advisable in the more favorable cases, especially

those where the extremity is not too much shortened and the muscles are still functional—principally flexion-contractures and the rarer ankyloses in abduction. Where only a correction of position and an immovable union is desired, he points out the superiority of osteotomy below the trochanter, with section of cicatricial bands, and even, if necessary, the contracted muscles (ileo-psoas). Where both hip-joints are to be operated for ankylosis, he does not find it best for purposes of walking to secure mobility in more than one. The resection should be done first, and its result awaited. If a movable joint is not obtained, an opportunity will still remain to attempt to procure one by a similar operation on the other side.—*Centbl. f. Chirg.* 1885. No. 15. April 11.

W. BROWNING (Brooklyn).

## Gynæcological.

I. FIFTY CASES OF ABDOMINAL SECTION, WITH REMARKS ON LAPAROTOMY. By JAMES B. HUNTER, M.D., (New York). Of the cases reported, 27 were cases of ovariectomy, as usually understood by that term, of which 23 recovered and 4 died; 17 were extirpations of ovaries and Fallopian tubes, of which 12 recovered and 4 died; 5 were extirpations of uterine fibroids, with 4 recoveries and 1 death; and 1 was for the relief of pelvic abscess, terminating in recovery. In all, 50 operations, with 9 deaths. Details of a large number of cases, that presented features of special interest, are given. The author advises that, where there have been extensive adhesions separated, or where any portion of a cyst remains, or where there is a very large pedicle, the use of a drainage tube is advisable, the best tubes being those of glass, of small caliber, perfectly straight and without openings at the side. He considers a carbolyzed spray to be invaluable in the operating room, but on no account to be allowed to play directly upon exposed abdominal viscera.—*N. Y. Med. Jour.* 1885. April 4.

II. INDICATIONS FOR OPERATION IN INCOMPLETE LACERATIONS OF THE PERINEUM. By W. G. WYLIE, M.D., (New York). The conclusions of this author are: 1. As a rule, when the perineum is completely severed, so that fecal matter escapes passively, the position of the uterus is not affected. 2. The external or lower part of the perineum may be torn to a considerable extent, and the position of the uterus will not be affected. 3. When the inner and upper part of the perineum is torn or over-stretched and relaxed, prolapse of the posterior and anterior vaginal walls will take place, and, in time, the uterus is retroverted, prolapsed, and may be forced out of the pelvis. 4. The explanation is that when that part of the perineum formed by the fibres of the levator ani and pelvic fascia, where they encircle and are attached to the lower end of the vagina and anus, are torn apart, and the lower end of the vagina and the upper part of the anus are loosened, so that they are not held up and elevated when intra-abdominal force is exerted, as in straining at stool, both are forced out through the vaginal outlet, and they pull and drag down the uterus, and in time result in hernia of the pelvic organs. 5. In operating to restore the parts, we should aim to reunite the separated edges of the levator ani and pelvic fascia, and fix them to and

in front of the lower end of the vagina and the anus, and lower end of the rectum. 6. This can be done efficiently only by denuding the retracted tissues on either side of the rectocele, and uniting them over the rectocele. As the most important laceration is within the ostium vaginae, to reach these tissues the operation must be within the vagina; and to secure good apposition and to avoid dragging down and adding to the tension, most of the sutures should be passed within the vagina from side to side.—*The Med. Record.* 1885. March 28.

III. TWO CASES OF GASTROTOMY FOR EXTRA-UTERINE GESTATION. By JAMES BRAITHWAITE, M.D., (London). These two cases of successful operation are of interest, especially with regard to the pathology of this condition. In both there was the history of an apparent rupture of a tubal pregnancy—at three months in one case, and at seven weeks in the other. In both, the pregnancy went on to full time, but the child, although well developed, was dead at the time of operation. In each case the uterus was found to be small—*i. e.*, 3 inches and  $2\frac{3}{4}$  inches, and the cervix uteri to be comparatively large. In one of the cases, the containing cyst was extra-peritoneal—*i. e.*, the fetus had passed down between the layers of the broad ligament, and then upwards between the peritoneum and the anterior abdominal wall. In the other case, the fetus was found in a false cyst, formed by inflammatory adhesions around it, and was lying within the peritoneum, but adherent to it at the anterior abdominal wall. Contrary to what one might have expected, the extra-peritoneal cyst was gangrenous at the time of operation, while the cyst which was formed anew within the peritoneum lived, and probably healed by contraction, although this is not specially mentioned. The placenta was differently placed in the two cases, being deeply situated in the extra-peritoneal case, and adherent to the anterior abdominal wall in the other case, this latter being evidently a new attachment. The placenta was detached piece-meal in both cases. There was no sign of septic poisoning in the case in which the cyst and placenta sloughed, and no mention is made of any in the other case. Except that the sloughing cyst was washed out with warm carbolic water, the details as to dressing are not given.—*Lancet.* 1885. January 3.

C. W. CATHCART (Edinburgh).

## REVIEWS OF BOOKS.

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OPERATIVE SURGERY IN THE CALCUTTA MEDICAL COLLEGE HOSPITAL:  
STATISTICS, CASES AND COMMENTS. By KENNETH MACLEOD, A.M.,  
etc. London: J. & A. Churchill. 1885. 8vo., pp. 351.

Few surgeons will have the industry and enthusiasm to imitate Professor Macleod in writing such a massive array of ordered facts, while we fear that only too many surgeons who could study it with infinite profit, will not take the opportunity. Every one of the author's eight hundred cases is here related graphically, and in more or less detail. They are arranged in classes, to each of which is added an instructive and judicious commentary. It is rather as a rich and truthful mine of facts than in any other way that this book will be valuable. But the comments will be found to be both agreeable and easy reading by any one who sits down to the book as to a volume of clinical lectures. Every where useful hints are to be gained; and in the author's frank pages each surgeon will find his own failures and difficulties paralleled.

Of especial value are the chapters on elephantiasis, on operations for hernia, on nerve-stretching and splitting (more particularly for anæsthetic leprosy). In these sections will be seen clear evidence of the author's originality.

Sets of cases, such as are to be discovered in this book, are of incalculably greater value than collections of equal numbers from the journals. The reason is very plainly stated in the preface of the work itself: "The single cases are most frequently the more striking or successful in the practice of the reporter, who does not consider it necessary to report the more commonplace or unfortunate. Successes are apt to be readily chronicled and failures unrecorded. Statistics based on data of this kind are simply untrue as representatives of the results of the particular operation whose instances are tabulated." Moreover, the task of collecting and analyzing these scattered journal-cases falls too often to some young gentleman who makes up in prejudice what he wants in knowledge and critical capacity.

The chapter on operations for radical cure of hernia is one of extraordinary merit. No other recent contribution to the subject can compare with it. No one should perform the "open operation" with-

out reading it. No one will read it without feeling how just and well-timed was the editorial published in the February number of this journal on "the dangers of modern operative procedures for the radical cure of hernia."

The book should be studied by every surgeon about to practice in India.

C. B. KLETLEY.

PETIT TRAITÉ SUR LES HERNIES. Par PIERRE FRANCO, Chirurgien de Lausanne. Réimpression identique au texte primitif. (Première édition, 1556.) Alcan. Paris. Gr. in-8. Extrait de la *Revue de Chirurgie*.

Born at Turriers, in Provence, at the end of the 15th or beginning of the 16th century, Pierre Franco ventured upon the practice of the art of surgery, in Lausanne, in Berne, Switzerland, and in 1556, as the fruit of thirty years of practice, he produced his *Petit Traité contenant une des parties principales de chirurgie. Laquelle les Chirurgiens hernieres exercent ainsi qu'il est montre en la page suivante. Fait par Pierre Franco, chirurgien de Lausanne*, originals of which are exceedingly rare. In it are presented the ideas and conceptions of Franco himself, with little regard to authority. His style is pleasing because of its simplicity of diction, and its honesty and sincerity. Holding no professor's chair, protected by no influential patron, not even possessing a university title, he was, perhaps, the best representative of the peripatetic operator of the 15th and 16th centuries, making frequent excursions into neighboring towns "for hernias, hare-lips and stones." He is said to have taught anatomy at Fribourg and at Lausanne in later years. A glimpse at his character is given in his dedication and preface, in which he states that his book is published for the benefit of "those who practice their profession with fidelity, and fail only from ignorance," and "to repress the arrogance of the quacks, who deserve to be punished by the magistrates as highwaymen, seeing that, under the pretence of giving aid, they torment their poor patients and cause them miserably to die."

Half of the work is occupied by his discussion of Hernia and its cure, whence arose, perhaps, the prevalent misconception that this first edition was simply a treatise on hernia. Under hernia he includes all scrotal and inguinal tumors—hydrocele, sarcocele, varicocele and humoral and gaseous tumors, and the ruptures properly called, intestinal and omental, and bubonocoele. His operations for the relief of hernia proper are radical indeed. Using the word *didymis* for the "two tunics which envelope the spermatic vessels and their contents," he defines intestinal hernia as the descent of the intestines into the



scrotum; and after the patient has been "well purged under the direction of a physician," he makes an opening at the most dependent part of the scrotum, for drainage. The intestines having been returned—by taxis I infer—and kept back by an assistant pressing in the pubic region, the testicle was seized at the lower part of the scrotum and removed with as much as possible of the didymis. The stump was then firmly grasped by peculiar clamps, while a ligature was passed through the middle of the didymis just above the clamps, then, including half of the didymis, it was passed back and out upon the other side and the two ends tied. The clamps were then loosened, the stump cauterized and allowed to drop into the abdominal cavity, the ends of the ligature hanging from the wound. The parts were then bandaged with a compress over the pubis, and the patient allowed to recover. In case of severe inflammation and the formation of "bad humors, free openings should be made for drainage, and antidotes administered internally, lest *"the poison mount to the heart and suffocate it."*

A second method, which has the great advantage of not requiring the removal of the testicle, consists in drawing the didymis through an incision at the superior part of the scrotum, dividing it into four equal parts and ligating the two middle ones, as in the preceding operation. A third method is similar to the second, except that the ligature is of gold wire, which is permitted to become encysted, since it is "a friend of nature, like lead."

Naturally his study of stone in the bladder is of particular interest, because it contains the first recorded account of the hypogastric operation. He opened with an account of the symptoms and medical treatment of lithiasis and the removal of urethral calculi. As symptoms he quoted simply a sense of weight at the pubis or perineum, with pain referred to the tip of the glans penis, and frequent erections, and perhaps a history of renal colic. He also described a metallic catheter, which he considered of value in suppression of urine, and as a means of diagnosis.

The ordinary method of operating required, according to Franco, the patient first to jump two or three times, to jar the stone down; then being held in the lithotomy position, which is minutely described, the operator introduced the fingers of one hand into his "fundament," and pressed upon the lower portion of the abdomen with the other, thus forcing the stone to the neck of the bladder; this done, an incision was made between the "fundament" and the testicles, two or three fingers breadth long and about an inch on one side of the commissure of the perineum. The operator cut very gently down to the stone and

cut the neck of the bladder upon the stone, holding it firmly from the rectum. The stone was then seized with the forceps or crotchet and drawn out. Franco never stitched the wound, finding it sufficient to draw the legs together. If inflammation of the bladder arose, he injected a "decoction of mallows, violets, roses, chamomile and similar things, adding what might be desired of oil of violets, roses, lilies, *scorpions*, and the like." If any stone still remained, he advised to inject the blood of a newly killed goat, which "has the faculty of easing pain and dissolving the stone" as well.

A second method, which he describes as the *grosse fermente*, is done with the aid of a grooved sound for guiding the point of the knife; into the incision thus made and guided by the groove was introduced a gorget—*gorgeret*—and upon it strong forceps, called *grosse fermente*, were introduced, the gorget withdrawn, the stone firmly grasped with the forceps and extracted. If the stone was very large, he considered its extraction very dangerous and preferred a method of of his own invention, which he described as "Another Method of Extracting Stone, incomparably better than Any Other, since It is without Danger and Great Pain, devised by the Author."

The peculiarity of this operation was that it was done in two parts on different days. The incision was made, and if the stone was small and presented itself at the opening, it was removed at once and the operation completed. If it were large, or did not present itself at the opening, the patient was allowed to rest and recuperate for a day or two. Then the stone was extracted with the forceps, if small; if not, it was broken with cutting forceps, which he had devised, and extracted piece-meal.

He, in common with his contemporaries, held that incision of the body of the bladder would be almost necessarily fatal, and warned surgeons to confine their incisions to the neck of the bladder, and it was not until twenty years later that Rousset dared, the first, to maintain that the supra-pubic method for cystotomy was no more dangerous than the others. Franco, however, is acknowledged to have originated the supra-pubic procedure, although he advised surgeons not to adopt it. His case—the earliest known case of supra-pubic lithotomy—he relates as follows:

"It occurred once that I wished to remove a stone from a child of ten years or so, but in spite of all my efforts, I could not bring it down to the neck of the bladder. In view of that fact, that the patient was very much exhausted by his sufferings, and that the parents desired rather that he should die than live in such agony; also that I did not wish it to be a reproach to me that it should not be extracted; although

it was foolish, I decided to cut the bladder from the pubis, a little to the left. This I did, cutting upon the stone, which I had raised up with my fingers inserted in the fundament and held under control with the hand of an assistant, who compressed the abdomen into the pelvis: and in this way I extracted it. The stone was as large as an egg. Nevertheless, the wound consolidated and was healed. However, I would not advise anybody to do this, but rather to use the procedure devised by us, of which we have spoken."

Time had, until recently, little varied the mode of extracting stone from the female bladder from the methods taught by Franco. Were the stone small it was extracted through the urethra, which could be dilated to admit the finger; if large, he withdrew it through an incision made into the neck of the bladder from the vagina.

He devoted considerable space to a description of his method of couching for cataract and to a discussion of the difference between hard and soft cataract. His procedure was simply to force the lens backward and downward into the vitreous with a needle, directing that when pushed back, it should be held there "during the time of saying the Lord's prayer two or three times or more, as would seem expedient."

In opening his section on hare-lip, he fulminates his belief that the opinion that "what God has given from birth cannot be cured, is not only wrong but heretical, as says Guido. I have cured many by the help of the Lord: wherefore I will show how one must needs proceed." The method preferred by him, was, after having freshened the edges of the fissure, to draw them together with two triangular pieces of sticking plaster, so as to bring the edges in apposition and stitching the pieces together. Another method was by passing needles through the flaps in the manner of hare-lip pins.

His chapter on the "Manner of Extirpating an Arm or Leg" is very brief, including directions as to the mode of placing and fastening the patient to the table and to encircle the limb tightly with a band an inch or two above the proposed point of incision. He performed the circular operation, preventing hemorrhage with the actual cautery or boiling oil. Then, with a chapter on *Luppiës* or wens, he closes his account of 'those things of which, from his experience, he considered himself especially qualified to speak.'

Of this work the first edition was issued from the press of Antoine Vincent at Lyons in 1556; an enlarged and revised edition in 1561; and in 1884 a reprint of the first edition was issued by the editors of the *Revue de Chirurgie* of Paris, to whom is due the cordial acknowledgments of the student of history of medicine for making this treasure available.

JAMES F. PILCHER.

A PRACTICAL TREATISE ON MASSAGE: Its History, Mode of Application, and Effects, Indications and Contraindications, with Results in over fourteen hundred cases. By DOUGLAS GRAHAM, M.D., Fellow of the Massachusetts Medical Society. William Wood and Company, New York, 1884.

In view of the extravagant claims made for massage, and in view of the return of this agent to popularity, Dr. Graham has done a good work in bringing into scientific shape the present knowledge of the subject.

The volume before us aims to resuscitate valuable articles, and to give the experience of the writer. In carrying out this object he has very properly made a clinical work, and has introduced quite freely reports of cases wherein success and failure alike play important parts. No one can, with any justice, accuse Dr. Graham of concealing facts. A careful perusal of the work will convince the most skeptical that the author has succeeded admirably in giving the profession a fair and candid portrayal of the results that have been obtained not only by himself, but by many whose reputation all men respect. His deductions are sometimes a little faulty, or extravagant, we think, but in the main these are stated with more than the usual reserve of an enthusiast. And let it not be understood that the reviewer has one word to say in disparagement of enthusiasm. The frequent occurrence of cases, too, is heartily commended. These make a book on this subject really valuable. Those cases that have been treated with massage reported in scientific language, with a diagnosis recorded and a lesion located, are refreshing to the average medical mind.

There are sixteen chapters, making 255 pages and no one of the chapters is prolix. The first four have to do with the history, the mode of applying and the physiological effects, and there are many historical facts which make the first chapters entertaining. The art is as old as history itself. Hippocrates was a warm advocate of rubbing, or anatripses, and gave in his aphorisms full directions as to the mode of procedure. Indeed all the noted writers of antiquity attached great importance to this therapeutic agent. To recount in this connection the various features of interest in the historical part of the work would make the review unnecessarily long, and might deprive one of the pleasure and the instruction afforded by reading the original.

The author is sufficiently clear in describing the modes of employing massage to enable one to familiarize himself with the practice, and he calls attention to many erroneous impressions people get on the subject: for instance, that "those who are of a remarkably healthy, ruddy appearance, plethoric and fat, are the best fitted to do massage," and that

the exhibition of vascular turgescence about the face of the masseur, perspiration and other signs of fatigue are evidences that the "magnetism" is being imparted to the patient.

Tact and a close study of the movements required, make the best masseurs, and Dr. Graham endeavors to impress upon his readers the fact that the art must be learned thoroughly before one can hope to attain success. "In quality and endurance the strength necessary for doing massage is different from that required to scrub a floor, swing a sledge-hammer, or win a boat race."

A chapter is devoted to neurasthenia and anæmia of women. Cases illustrative of the benefits derived from massage are taken from the writings of Playfair and Weir Mitchell.

A chapter on massage of the uterus and its surroundings contains an analysis of 239 cases. This chapter contains none of the author's experience, and is "padded," so to speak, with so much material from foreign sources and from men with whose writing the general profession are so little acquainted, that we must look upon it as impractical to say the least. Massage of these organs can be done only by the "accomplished gynecologist." "Massage of the pelvic organs should be intrusted to those alone who have 'clean hands and a pure heart' and such a thorough knowledge of the pathology and treatment of uterine affections as is possessed by the most accomplished gynecologists."

"The operation consists in introducing an index finger into the cul-de-sac behind the cervix, in such a manner that the posterior surface of the uterus is reached. This is then raised as far as possible, while the fingers of the other grasp and knead the uterus through the abdominal walls."

The tabular report of Dr. Otto Burrge's cases does not convince the reviewer of this work of the great value of massage. Dr. A. Reeves Jackson, of Chicago, is credited with some remarkable results, and the class of cases in which he has employed massage certainly justify the treatment.

There can be no objection to massage in the parturient state, and as the author remarks, massage of the uterus is employed by all obstetricians. But such treatment of the uterus in young women should be condemned. Our author feels that he is treading upon dangerous ground, and at once disarms criticism by concluding this chapter with the following paragraph:

"When it is remembered that these internal manipulations are painful and exhausting to the patient and tedious and difficult to the physician, no comment nor sinister remarks are necessary. Those who have made use of them are gentlemen whose characters and motives are beyond question."

A valuable chapter on massage of the liver, stomach and intestines next follows, and will certainly meet with much favor. Cases of obstinate constipation, intussusception and infiltration after perinephritis are recorded with the usual care and faithfulness.

In cerebral neurasthenia he has not found massage of service; indeed massage is contra-indicated. In the chapter on affections of the central nervous system, one looks longingly for the case wherein massage has been of real and positive value. Take, for instance, cases of poliomyelitis anterior. On page 147 he reports the cases of Willie P., sent him by Dr. J. J. Putnam, as one of paralysis resulting from poliomyelitis anterior acuta. He was five years of age, and his poliomyelitis is said to have appeared when he was ten months of age. The author has some hesitation in presenting this case, although the diagnosis was made by an expert. The reviewer cannot accept it with the little evidence recorded in the history. On the same page the history of a lad seventeen years of age is reported. The results in this case after six weeks' massage do not bring any hope to these unfortunates. Massage will not restore these palsied muscles, and he who claims that it will must adduce stronger proof than Dr. Graham adduces in this chapter.

In locomotor ataxia good results are claimed, and yet we are not prepared to accept any conclusions which predicates of this disease a cure. To find symptoms at a stand-still and to meet with cases with long remissions—this we expect. Our author does not belong to that class of men who even think it possible to cure a case of locomotor ataxia.

His remarks on chorea are open to criticism, but this review is already too lengthy. In writers' cramp extraordinary results are chronicled, and the cases are so well recorded that this chapter alone will abundantly repay one for the purchase and study of the book.

In neuralgia and peripheral paralysis the mode of employing is well set forth, and instructive cases attest the value of the agent. The writer of this review read the chapter on massage of the joints with as much avidity as he read that on central nerve lesions, and it must be confessed with as little satisfaction.

His conclusions legitimately, drawn from the cases reported, are those with which most of us are familiar, viz: that a joint with a peri-articular lesion, the result of a trauma is relieved and often cured by massage, but that a joint with bone disease in close proximity is not the joint for the employment of indiscriminate massage.

V. P. GIBNEY.

## SECONDARY NERVE SUTURE.<sup>1</sup>

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IT has long been known that divided nerves would, under certain favorable conditions, unite, with restoration, more or less complete, of the functions which had been abrogated by the injury. Indeed, this fact has played a prominent part in the results of the operations which have been performed on nerves, the seats of neuralgia, where it has been sought to cure the pain by abolishing the sensibility of the affected nerve, by separating it by section from its trophic centre. These operations, as is well known, though giving temporary relief, have commonly failed to be of permanent benefit, because the divided nerves after a certain lapse of time have reunited, with re-establishment of function which has announced itself by a return of the pain in all its original severity. To avoid this disappointing result, operators have been at much pains to prevent, if possible, the reunion of the divided trunk, and various devices have been resorted to for this purpose. Sometimes considerable portions of the nerve have been removed, sometimes a loop of the excised nerve has been doubled back at each cut extremity, and some have fastened back these loops by sutures or ligatures. Some have modified this procedure, where the trunk was easily accessible, by burying the looped ends deeply in the surrounding tissues, and sometimes foreign bodies have been interposed between the divided ends to keep them separate until the disposition to unite should disappear. In spite of all these precautions, it

<sup>1</sup> Read before the New York Surgical Society, February 24, 1885.

has not been possible, in certain cases, to prevent a recurrence of the neuralgic disorder,—a recurrence which is generally believed, and in some instances has been proved, to be associated with a union, and sometimes with an extensive regeneration, of the injured nerve. Examination of nerve-trunks which have undergone this regeneration have shown the nerve-tubules perfectly restored in their continuity, and but little changed in their normal condition.

Such facts as these led very naturally to the hope that nerves, accidentally divided, and where restoration of function has not occurred, might be restored to their normal powers of transmitting sensory and motor impressions by exposing the injured trunk and bringing together by suture the divided ends. This operation is not by any means a new one. It was done by Arnemann in 1826, and by Flourens in 1828, and it is stated that it was practiced by Dupuytren, in several instances, at the Hôtel Dieu. It was not, however, until after the elaborate researches of Augustus Waller, which were published in the *Comptes rendus* of the Academy of Sciences in Paris, in the year 1852, that the operation was placed on a scientific basis. He showed, by means of experiments on animals, the whole history of degeneration and regeneration of nerves after injury so completely that he has left scarcely anything to be done by his successors, and, encouraged and guided by his discoveries, surgeons have performed the operation of the suture of divided nerves in a large number of cases in England, on the continent, and in this country, with a success generally extremely satisfactory, though it must be acknowledged not equally or uniformly so. The operation has been done in certain instances immediately on the receipt of the injury, while the cut surfaces were yet fresh; and it has been done as a secondary operation, weeks, months, and even years after the original accident, thus dividing the operations into two classes, the primary and the secondary. It is of the latter only, the secondary operations, that I propose to speak this evening.

I have had the opportunity of performing the operation in two cases, of which the histories are as follows:

Valentine Keller, a German, aged thirty-six, was brought into the New York Hospital, December 25, 1883, with a stab wound of the



left arm. The wound was situated on the external aspect of the arm, about two inches above the external condyle of the humerus. It was not more than half an inch long, but the blade of the instrument had penetrated so far as nearly to transfix the limb, grazing in its course the anterior face of the bone. It was noticed that there was no pulsation at the wrist. A counter-opening was made at the point where the wound approached the skin on the inner side of the arm, and a fenestrated drainage-tube passed from one opening to the other. The day after his admission, without any apparent cause, a profuse arterial hæmorrhage took place. The wound on the inside was enlarged, and the brachial artery tied above and below the wounded point. No further hæmorrhage occurred, but the loss of blood had been so great as to bring on a condition of collapse which was very alarming. Transfusion with a saline fluid was promptly resorted to, and gradually the patient rallied. The wound healed slowly, mainly by granulation, and cicatrization was not complete till the end of January. On the 20th of January attention was called to the fact that paralysis, both of sensation and motion, existed in the parts supplied by the musculo-spiral nerve. There was loss of the power of extension of the hand; flexion of the hand not impaired. There was loss of extension of the fingers, flexion remaining perfect, motions at elbow joint perfect. Anæsthesia, but not complete, existed over dorsal surface of thumb, index and middle fingers, with a good deal of burning pain. He had now recovered his general health, but no improvement could be discovered in the paralyzed parts, though electricity and massage were daily and faithfully employed. He suffered so much from the causalgia, and the trophic disturbances in the muscles and skin were beginning to show themselves so distinctly, that suture of the nerve was decided upon, and performed on the 9th of February, forty-six days after the receipt of the wound.

An incision was made along the course of the musculo-spiral nerve, having the scar of the wound as its centre. A good deal of cicatricial tissue was encountered in passing down between the brachialis anticus and the supinator longus, but, when the nerve was reached, it was found to be free and distinct above and below the point of injury; and was, without much difficulty, isolated from the cicatricial mass and cut off clean with a pair of sharp scissors. By flexing the arm the divided ends could be easily brought together, and the two were united by two slender catgut sutures passing through the substance of the nerve. The signs of degeneration of either end were not distinct. The wound was carefully closed and the forearm left flexed at about a right angle with the arm.

*February 10th.*—Complains of much pain in the wound, but says he feels it radiating down the limb, along the musculo-spiral distribution, mostly on the dorsum of the thumb and the index finger. This pain was regarded as a favorable sign, and, it was hoped, would be the precursor of rapid restoration of lost power. This expectation, however, was not realized. The pain gradually subsided, and then disappeared altogether, the wound meanwhile healing well, mostly by primary union. By the time the operation was performed the man had recovered his health and strength, and seemed to be in as good a condition as could be desired for its success. Electricity and massage were employed daily, and he was encouraged to use the arm as much as possible. The faradaic current caused no response. The galvanic produced at first some contraction, but this soon ceased entirely. The affected muscles were flabby, but not appreciably atrophied. He was kept under observation, and treatment was sedulously continued, when, on the 14th of April, at his own request, he was discharged from the hospital. At this time there was no apparent improvement in the condition of the paralyzed muscles. The conditions as to sensibility were not noted. The hand and fingers were perfectly powerless so far as extension was concerned, and the member was therefore practically useless. I explained to him that restoration of function was often long delayed in these cases, and encouraged him to use all the muscles of the limb that were capable of acting, and in particular I urged him constantly to direct his will along the paralyzed cord and try to make the muscles respond to their natural stimulus. I heard nothing more from him except that he was under Dr. McBride's care in the outpatient department of the hospital, and was not improving. Recently, however, I have received a note from Dr. McBride saying that Dr. S. O. Van der Poel, Jr., who had acted in his absence, had reported to him that the man had so far recovered the use of the limb as to be able to go to work.

I saw him on the 1st of February, and found that he had regained the use of the paralyzed muscles so far that he could extend the hand and fingers, and supinate the hand almost to the full extent, and with a good deal of power. The actions could not be performed rapidly as yet, nor completely, owing, no doubt, to the stiffness of the joints concerned from prolonged disuse. He is conscious of daily improvement, both in strength and facility of movement. The muscles can be felt to contract under the finger, and have regained their normal bulk and firmness.

The second case was to me one of unusual interest, as I had no experience, either of my own or of others, to guide me in

diagnosis, prognosis, or treatment. I believe the case to be unique in the history of surgery.

Lillie Dougherty, aged five years, was admitted to the New York Hospital, Oct. 22, 1884, with a wound of the neck, inflicted by a sharp, clean instrument, a short time before her admission. There was found an irregular wound, extending from the nucha on the left side, opposite the fourth cervical vertebra, passing obliquely downward and forward to the posterior border of the sterno-cleido-mastoid muscle, and stopping about an inch above the upper margin of the clavicle. The sterno-mastoid and the trapezius were both partly divided. Considerable hæmorrhage had occurred, but no vessel required a ligature. The child was slender in form, pale and delicate in appearance, but in good health, as far as could be ascertained. The wound was brought together carefully, treated antiseptically, and healed, partly by granulation, in about a month. Soon after the injury, October 30th, it was noticed that she was unable to raise the right arm from the side, and gradually, as the disability of the shoulder from the wound subsided, it became evident that a certain amount of paralysis existed, unquestionably dependent upon some nerve injury inflicted in the depth of the wound. There was no nerve-trunk in the course of the wound whose division could account for the paralysis, and in point of fact nothing but a wound of some part of the brachial plexus was competent to explain the symptoms presented, and this idea was rejected by me at first, and for two reasons: First, the wound did not appear deep enough to reach any part of the brachial plexus, and, second, the line of incision in the neck seemed to be entirely above the course of the fifth cervical nerve, which forms the uppermost cord of the plexus. On carefully studying the conditions, however, I finally reached a positive diagnosis, becoming convinced that nothing could have happened in such a wound, except a severing of the upper cord of the brachial plexus, which could afford an explanation of the symptoms presented.

These symptoms were loss of power of abduction of the arm and of flexion of the forearm upon the arm. Supination was limited and feeble; pronation good; extension of the forearm slightly, if at all, affected. Flexion and extension of the hand and fingers were not notably impaired. Anæsthesia was well marked over the shoulder and the outer aspect of the arm. By the time that cicatrization of the wound had taken place, about the 1st of December, these signs of paralysis had become perfectly distinct, and it was also noted that atrophy was beginning, and was, in fact, well marked in the deltoid, and supra and infra-spinatus muscles, and less distinctly in the biceps and brachialis anticus.

She was placed upon tonic and invigorating treatment and regimen,

and everything was done to improve and maintain her general health. Faradization of the affected muscles and friction of the shoulder and arm were continued daily, without any manifest results. The general condition improved very much to our satisfaction. She was very tractable and obedient in seconding our efforts to make her use her arm and shoulder muscles, as far as her will had any control over them. No improvement could be discovered, the arm hung useless by her side, and, when she wanted to play with her dolls, she had to lift the palsied arm on to her lap with the other hand, and then she could use the fingers to hold it.

On the 8th of December a careful examination of the reaction under galvanic and faradaic currents, was made, with the following results:

## MUSCLES OF THE SHOULDER.

<i>Nerve.</i>	<i>Muscle.</i>	<i>Galvanic Current.</i>	<i>Faradaic Current.</i>
Spinal accessory.	Sterno-mastoid, trapezius.	Normal.	Normal, m. and n.
Anterior thoracic.	Pectoral.	Normal.	Normal.
Subscapular.	Latissimus dorsi.	Normal.	Normal.
Circumflex.	Deltoid.	Normal; increased when applied to muscle direct (reaction of degeneration).	Absent; muscle atrophied.

## MUSCLES OF THE ARM.

<i>Nerve.</i>	<i>Muscle.</i>	<i>Galvanic Current.</i>	<i>Faradaic Current.</i>
Musculo-cutaneous.	Biceps, brachialis anticus.	Normal; increased when applied to muscle direct (reaction of degeneration).	Absent, m. and n.; atrophy of muscles.
Musculo-spiral.	Triceps, supinator longus.	Normal.	Normal, or slightly diminished.

The reaction of the muscles supplied by the rhomboid, suprascapular, and long thoracic nerves could not be satisfactorily obtained, but the muscles themselves showed marked atrophy. The muscles of the forearm were not involved.

The faradaic current was now replaced by the galvanic, which was applied daily. No improvement in muscular reaction. Atrophy of shoulder muscles appears more marked. Her general condition is greatly improved. She is in good spirits, eats and sleeps well, and presents the appearance and demeanor of a child in good health.

That the most careful study of the paralyzed muscles alone would have warranted a diagnosis as to the precise point of injury, I am not prepared to assert. Taking, however, all the points as they have been

presented above, and associating them with a careful topographical survey of the line of the wound, and there seemed to be but one conclusion to which all the facts pointed, and that conclusion marked the fifth cervical nerve, which is the first or upper cord of the brachial plexus, as the seat of the injury, and, in consultation with my colleagues, it was deemed right to make an attempt to suture the wounded cord, in the hope of restoring the functions of a limb in its present condition absolutely useless. In view of the fact, however, that these injuries to nerve-trunks do sometimes recover spontaneously, it was thought best to wait, before undertaking any operation, until it should become quite certain that nature was unable to effect a cure. Accordingly, treatment was steadily persevered with until the beginning of March, when, no improvement being perceptible, it was deemed justifiable to try what surgery could do to bring relief.

The operation was done March 2, 1884, one hundred and thirty-one days after the infliction of the wound. An incision was made along a line corresponding to the upper part and outer margin of the brachial plexus, and carefully followed down until this border of the plexus was reached. The cicatricial tissue was very extensive, and very confusing as we tried to recognize the anatomical landmarks, and a very careful and tedious dissection was necessary before we clearly recognized the nerve-cord involved in the wound. Finally, however, the nerve-trunk above and below the wound could be distinctly seen, and was isolated sufficiently to enable us to trace its whole length from the point of its emergence from the intervertebral foramen to the point where it joins the plexus below.

We were extremely careful not to handle roughly, nor to pinch with forceps, any part of the exposed nerve, and this it was that so greatly prolonged an already very tedious operation. The cord, which was now seen to be the upper root of the plexus, as we had originally supposed, was divided in two places with sharp scissors, so as to include all that part involved in the cicatrix, leaving a clear cut on both distal and proximal ends through healthy nerve-substance. I say healthy nerve-substance, but it became evident, on making the section, what I suspected when the nerve was first exposed, that the distal portion beyond the cut was in a condition of physiological integrity, while the short portion, less than an inch in length, which formed the proximal stump, was manifestly smaller, its fibers not so clean and glistening as in the cord below and in the surrounding nervous trunks. In short, it was the proximal, and not the distal portion of the cut nerve which had undergone the classical degeneration, the distal portion retaining almost perfectly its normal appearance. I very much regret that I can not

make this statement with the authority which would give it value as a scientific fact: for, unfortunately, no microscopic examination of the cut ends was made, and I am well aware that the gross appearances, though very distinct, would not alone be reliable evidence as to the condition of the nerve-tubules. Two very fine catgut sutures were now passed through the cut ends and tied not very tightly. Some strain on the suture was easily overcome by flexing the head on the trunk, and drawing it toward the left side. In this position it was secured by bandages. The wound was dressed with iodoform and sublimate gauze, and behaved perfectly well, though not healing entirely by primary adhesion. By the 14th of March the wound was cicatrized, and she soon regained her usual condition of health. Convalescence was delayed by a pretty threatening attack of purulent conjunctivitis, which at one time seriously threatened the cornea. This, however, passed safely by, with no corneal damage, and no further complication occurred. The electrical treatment was resumed, and continued during the remainder of her stay in the hospital. No improvement followed the operation, and at the time of her discharge, in the beginning of May, the condition of the muscles, both with regard to electrical reaction and voluntary motion, was just what it had been before the operation, saving that the atrophy, particularly of the deltoid, was more than ever conspicuous.

During the summer she was taken to the country, and seemed in all respects quite well, but no change in the paralyzed parts was noticed until about the 1st of October, when slight voluntary motion began to show itself, which slowly but steadily improved. About the middle of January she was brought to my office, and I was delighted to find that she could flex the forearm upon the hand, and could abduct the arm from the side, during which movements the muscles could be felt contracting and hardening under the finger placed upon them. The shoulder had recovered its rounded contour, and the flexor muscles had become markedly developed. In short, the evidences of atrophy had disappeared, and the indications of voluntary power were daily increasing. On the 21st of February I saw her again, and found the extent and power of muscular motion surprisingly increased. The case promises to prove a complete success.

The study of this whole subject during the last fifty years has led to some important and very interesting discoveries as to the behavior of nerves under and after severe injury. In the first place, it has been shown that, after complete section of a nerve-trunk, there ensues a degeneration of all of that

part of the nerve beyond the point of severance, which extends throughout the whole distribution of the cut nerve, and is so complete that, according to most observers, all trace of original nerve-tissue is lost. There is, however, considerable discrepancy of opinion as to the completeness of this destruction, some contending that it is absolute and entire, others believing that the sheaths of Schwann and the axis-cylinder never entirely disappear. That nerves thus degenerated after section was known long before his time, but Augustus Waller, in 1852, by his admirable and ingenious experiments, brought out all the facts connected with both the degeneration and regeneration of nerves so completely that scarcely anything of importance has been added to the history of the process since his time. The changes, as described by Ranvier, are about as follows: The experiments being conducted on cats and dogs, it was found that after section of a nerve the distal segment began to show signs of change as early as the first day. The myelin begins to disintegrate, and by the fourth to the sixth day has mainly disappeared, leaving the sheaths of Schwann filled with fine, fatty granules. The axis-cylinder has also, by this time, according to his observations, entirely disappeared. By the twentieth day the sheaths of Schwann have become empty, and this he considers to mark the extreme point of degeneration, from this condition very little change being observed. A similar degeneration is noticed to begin at the cut extremity of the proximal end, but only reaches for a line or two from the end of the nerve, and then ceases, the axis-cylinder remaining unchanged. This disintegration is now to be followed, after a varying interval, by a regeneration, by which, in favorable circumstances, the altered nerve is to be restored to its normal condition and functions. This change consists in a reversal of the steps which the nerve took in its degeneration. The sheaths of Schwann, which, according to this observer, never entirely disappear, begin again to be filled out with a granular substance, which soon assumes the character of myelin, the axis-cylinder makes its reappearance, and, in short, the atrophied and shrunken cord gradually assumes the appearance, and nearly the dimensions of the original nerve. While this reformation of the nerve-tubules is going on, the union of the

cut ends is being accomplished. By about the twentieth day fine delicate fibers begin to sprout from the proximal end into the cicatricial tissue which surrounds it, and, gradually developing themselves in size and perfection of organization, shoot through the intervening bond of union till they encounter the distal end, with which they amalgamate themselves. Finally, if the ends are in good apposition, the cicatricial bond of union is occupied and displaced by a newly-formed nerve, which joins the two into one continuous cord, in which the individual nerve-fibers are almost perfect imitations, perhaps on a slightly reduced scale, of the original nerve-elements. In the animals experimented on, the repair was not perfected until about six months had elapsed. In man, it is probable that the period of perfect restoration is longer, but no accurate knowledge on this point has been attained.

Another of the effects of nerve-section, which has of late engaged the earnest attention of both physiologists and practical surgeons, is the paralysis of motion and sensation, which usually follows a complete section of a nerve-trunk. I say usually, because the results of nerve-division are by no means uniform or constant. There are reported, for example, a certain number of cases in which, after complete section of a nerve-trunk, no loss of sensibility could be detected in the parts supplied by it, and a certain number of others in which sensibility, being momentarily suspended, has been regained in a period so short as to make the immediate and perfect union of the divided ends the only explanation possible of the rapid restoration of nerve-power. Still further, it is constantly noticed that anæsthesia following a divided nerve-trunk does not by any means accurately correspond with the area of distribution of the branches of that trunk, but is much less extensive than it should be, anatomically speaking, sometimes occupying only a small part of the region, the whole of which we should expect, *a priori*, would be affected. To the explanation of these facts much attention has been given by German and French observers, and much careful research has been expended, with the result of leaving some of the phenomena not as precisely accounted for as might be desirable.

The first mode of explaining these facts of the limited area



of anæsthesia, and the rapid return of sensibility, is by invoking the aid of anastomosis. That anastomosis, in the ordinary acceptance of the term, does not exist among the nerves, is conceded. It has been demonstrated by Waller that the nerve-tubules individually are continuous from the point of their central origin to the point of their final distribution, and that no communication exists between the myelin in these tubules, and that therefore one tubule can not take up the function of a neighboring one which has been injured. It has been clearly shown, however, by the elaborate experiments of Arloing and Tripier, that, in the cat and the dog, and in the horse and the ass, there are certain tubules which pass from one nerve to another in a continuous or in a reverse direction, to be lost on the nerve to which they have attached themselves at a varying distance on the adopted trunk. These intercommunications are found first in the plexuses, where they are probably very frequent. Second, in the branches which are known to pass from one nerve-trunk to another in the course of its distribution, such as those that pass between the median and the radial, and the anastomotic twig that joins the ulnar and the internal cutaneous. The most abundant anastomosis, however, is found near the peripheral termination of the nerves, where all the terminal twigs unite to form the network of final distribution.

Another explanation of the partial and limited anaesthesia which sometimes follows nerve-section is found by some in the belief that there may be such a thing as the immediate union of the divided ends with immediate restoration of function. This belief is entertained by such men as Schiff, Gluck, Tillmans, Paget, and more recently by Caput and Wolberg, who consider that this primary union is so prompt and complete that no degeneration of the distal fibers can take place; while, on the other hand, it is held to be untenable, because unproved, by such observers as Nicaise, Weir Mitchell, Letievant, Brown-Séquard, and indeed by the majority of the most distinguished experimenters. These observations as to the limitations of paralysis after section do not apply quite so commonly to lesions of motility. Here the conditions seem to be somewhat different. The effect of section here seems to be, almost

uniformly, a complete motor paralysis, followed pretty early by muscular atrophy, which continues until the function of the nerve is restored by its union. Letievant has, however, called attention to the fact that even here there is room for deception, the associate muscles not paralyzed acting so as in a measure to supply the deficiency of those that are paralyzed, so as to give to the whole group what he calls supplemental motility, which may easily mislead the careless observer. This error is easily avoided by applying the electrical test and by noting the atrophy which is sure to develop itself soon after the nerve supply is cut off. These electrical tests are exceedingly valuable in all stages of these injuries, and may be furnished by both the faradaic and the galvanic currents, applied either to the cut end of the nerve or to the skin over the belly of the affected muscle. It is noticed that the electrical current, applied in either way, soon after section, causes a feeble contraction of the palsied muscles, but that this contraction grows less and less from day to day, as the muscular fiber is undergoing disorganization, and finally ceases altogether, the strongest current producing no response. A curious fact is observed in connection with these electrical tests. It is thus expressed by Nicaise: "The faradization curve during the first fifteen days becomes gradually depressed. After the third week the muscle is no longer excitable, at least through the skin. Toward the sixth week, in favorable cases, the excitability reappears, and gradually increases until it reaches the normal reaction. The galvanization curve follows an entirely different course. During the first fifteen days it follows the faradization curve; but from the third week, when the interrupted currents have no longer any effect, the galvanic reaction becomes exaggerated, the curve is raised, soon exceeding the normal, and reaches its maximum when the other is at its minimum. At the moment when repair begins to take place, the galvanic phenomena follow an inverse order; at the same time that the faradaic current is raised, the galvanic curve is lowered, and both gradually return to the normal level." This is what is spoken of as the reaction of degeneration by the German authors.

With regard to the facts of compensatory nerve-supply, after

section of a trunk, there can be no doubt, as the facts are so common and so easily observed; but as to the part which anastomosis takes in this return of function, our knowledge can hardly be said to have assumed a positive character. For example, the experiment by Arloing and Tripier—in which each of the four nerves going to a toe in the dog's paw were successively divided, with the result that no insensibility to pain followed the division of the first nerve, and none followed the second, and none the third; but when the fourth was cut, complete anæsthesia was immediately produced—seems to indicate so perfect a communication between the different nerves at some part of their course that we can hardly understand why, if this communication is always present, a severed nerve should show any sign whatever of paralysis.

Another point in the anastomotic theory, which at first seems hard to comprehend, has reference to the communicating branches which join together some of the larger trunks. In these there have been shown to be fibers which pass from one trunk to another, recurving toward the cerebral centers, when they reach the trunk to which they are destined, and reaching a certain distance up this trunk toward its point of origin. Now, as far as we know, nerves in their normal condition transmit impressions only in one direction, *i. e.*, the sensory nerves send their current from the periphery to the center, while the motor fibres bring the mandates of the central organ to the muscles at the periphery. If, therefore, there is to be any anastomotic current supplied through these recurrent fibers, the nervous impulse must pass along the nerve in a reverse direction to that which it originally followed. This is a fair objection to this part of the theory, and at first sight seems well taken. The well-known and ingenious experiment of M. Paul Bert I think fully answers the objection. M. Bert made an incision along the back of a rat, and then, having denuded the end of the tail of its skin, placed the tail thus denuded in the incision in the back, where it adhered firmly. After the union had become firm, he cut off the tail at its root, leaving its end adherent to the back. Now, upon irritating the tail at its root, evidences of sensibility to pain were distinctly manifested, showing that a nerve under altered cir-

cumstances could convey impulses in a reversed direction, very much as a telegraph-wire can convey messages in both directions.

Of the *technique* of these operations, but little requires to be said. The injured nerve-trunks are usually superficial, and therefore easily accessible. In the operations which I have done, the main difficulties have been, first, the finding and identifying the atrophied extremity; and, second, the disentangling, without bruising or laceration, of the cut ends from the cicatricial tissue by which they are surrounded, and with which they are apt to be very closely incorporated. Both these proceedings require great delicacy in handling, and great patience in unraveling the slender and fragile fibers, and in extricating them unharmed from the tough and unyielding cicatrix in which they are buried. Another difficulty which I encountered in the neck case was the misleading effect of the cicatricial tissue when I was trying to follow down the areolar interspaces in order to arrive at the injured nerve. So utter was the confusion of layers that, although I had rehearsed the operation many times on the cadaver, I found myself wandering so far from my course that I was well over toward the jugular vein before I could be sure of my landmarks. The two ends of the divided nerve being exposed, the extremity of each is to be severed with a pair of sharp scissors, taking care to go sufficiently high to reach original nerve-tissue, and at the same time being careful to avoid cutting away more than is necessary lest the tension be increased when the ends are brought together. In one of my cases, that of the arm, microscopic examination showed no trace of nerve-fiber in the part cut away by the scissors, proving that my section had not reached the real nerve-end. This I think unfortunate, and must always delay, and probably sometimes defeat, the object of the operation. Various sutures have been used to join the cut ends, but opinion seems to have settled upon catgut, as fine as is consistent with strength. The shape of the needle is not unimportant. A common round cambric-needle is the best, making its way through the tissues by displacement rather than by cutting. Wolberg recommends a flat needle, shaped like a saber but without cutting edge. Some are care-

ful not to pass the needle through the substance of the nerve for fear of injuring the tubules. Most operators prefer to pass the suture through the body of the nerve, as securing a stronger hold. Some cut the two ends obliquely so as to make flaps which, being applied to one another, afford an increased surface of contact. Rawa brings the ends together side by side, and then surrounds them and binds them together with a catgut ligature. When much loss of substance has occurred and the ends can not be made to touch, Vanlear has suggested placing the ends in a Neuber's drainage-tube, and, with catgut threads attached to each end of the nerve, drawing them as near as possible together within the tube, and leaving the space between the ends to be filled up by the reparative material. In a case in which he found it impossible to bring the ends in apposition, Löbker resected the bones of the forearm, thus shortening the limb so that the ends could be approximated without tension. In an experiment, Gluck transferred a rabbit's nerve to the limb of a chicken with success; and on the human subject, Albert replaced an exsected nerve with a segment of nerve taken from a recently amputated limb.

The nerve-ends being brought securely together, great care is to be taken, by position of the limb, that no tension should occur. The wound should be brought together so as to secure primary union, if possible, as the healing by granulation is believed to exercise a very unfavorable influence on the result, particularly if it be long delayed, or accompanied by much suppuration.

The time at which return of sensation takes place is very variable, in some cases sensibility being well marked in a few days, in others not until months or even years have elapsed. It is sometimes noticed, as in my musculo-spiral case, that, very soon after suture, a painful sensation pervades all the branches of distribution of the severed nerve, and this is sometimes the precursor of a healthy restoration of sensibility. It is not so always, however, but sometimes gradually subsides, leaving the parts in their original, more or less, perfect insensitiveness. The return of motility is commonly longer delayed than the return of sensibility. Here we have not only the degeneration of the nerve, but degeneration of muscular fiber

to be overcome, and, accordingly, this paralysis is not only more slowly recovered from, but much more frequently remains a permanent disablement. It will be noticed that, in this communication, I have scarcely alluded to the trophic changes, which are so certain to ensue after nerve-section. This has not been because I undervalued these changes, either in their clinical or scientific aspects. It is simply because in the two cases, which have been the basis of my studies, these trophic changes never assumed any prominence.

With regard to the results of the operations that have been put on record, the most recent and best tabular statement is found in Weissenstein's article on Secondary Nerve Suture, in von Bruns's "*Chirurgische Klinik*," 1884. He gives the results of thirty-three cases, from all sources, in which the operation has been done at varying periods after the nerve injury, in almost every case after the original wound had healed. To these thirty-three cases I have been able to add the following:

1. *Dr. W. S. Halsted's case.*—B., aged twenty-two years, injured by glass. Degenerative reaction of muscles and complete loss of sensation in the regions supplied by the median and ulnar nerves at the time of the eighth month after the injury. Separation after paring off nerve-ends, about three inches. Neuro-plastic suture of median and direct suture of the ulnar, with relaxation sutures in both. Strong flexion of hand and forearm, and still some tension. The wound healed by primary union. No benefit six months after the operation.

2. *By Dr. Weir.*—Wound of sciatic nerve nine years previously, operated on December, 1882; catgut sutures. By suturing adjacent tissues, and flexing knee forcibly, approximation was obtained. No improvement in motility, but gain in general sensation, and great improvement in trophic changes, which had advanced to ulceration. The ulcers all healed and local nutrition generally improved.

3. *A case operated on by Dr. W. T. Bull in July, 1883.*—It was a case of wound of median and ulnar nerves with corresponding paralysis. The suture of both nerves with catgut was done about seven weeks after injury. Was discharged from the hospital about five weeks after operation, with both sensation and motility beginning to return, and improving daily.

4. *A case reported by Dr. Roswell Park, of Chicago,* in which the radial was sutured with catgut sixteen days after its division. The recovery was rapid, the patient being considered well in six weeks.

5. *The case reported by me above*, of musculo-spiral suture forty-six days after wound. Catgut suture, recovery of sensation and motion, with a useful limb; daily improving.

6. *The case reported above* of suture of upper cord of brachial plexus, one hundred and thirty-one days after its division. Recovery of sensation and motion, and nutritive condition daily becoming more perfect.

Müller adds two cases, and Tillaux also two cases, making the whole number of secondary sutures reported forty-three.

These ten cases, added to Weissenstein's thirty-three, make in all forty-three cases. Of these, thirty-three were successes, in so far that sensibility and motility were at least partly recovered. In six cases no improvement, or almost none, occurred, and in four cases the data were insufficient for statistical use. The dates of improvement can be given approximately thus: Traces of sensibility were noted in from two to four weeks. Traces of motility in from sixteen days to sixty; in two cases more than a year. Complete restoration of muscle function was marked in one case as occurring in twenty-six days; in several cases not till the lapse of one or even more years. All the authors seem to agree that electricity and massage greatly favored the return of function in the paralyzed parts. If now we consider that three-quarters of all the reported cases were more or less successful, and still further consider that many of the cases were reported so soon after operation that the full results had not yet been realized, I think we are warranted in concluding that the proceeding promises a degree of success which we can count upon in very few of the operations which we are every day performing. When we take into account the serious and permanent disability for the cure of which the operation is recommended, the entire freedom from danger to life, no fatal case having been reported, and the large measure of success which has followed its performance, we are entitled, I think, to regard it as one of the best and most useful contributions that have been made to modern surgery;

## AN EXPERIMENTAL AND CLINICAL STUDY OF AIR-EMBOLISM.

(Concluded from page 147.)

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### PROPHYLACTIC TREATMENT OF AIR-EMBOLISM.

AS clinical experience and experimental research have shown that the admission of air into veins may result and often has terminated in death, it is the duty of the surgeon, in extirpating tumors which are in close proximity to the large veins within the area of the "danger zone," to resort to measures which will prevent the ingress of air, in case a vein is accidentally wounded.

The following precautionary means deserve consideration: 1, position; 2, compression; 3, ligature; 4, aseptic tampon.

1. *Position.* Regular respiratory movements of the chest are necessary to maintain the equilibrium between the arterial and venous circulation, and should always be secured in operating in close proximity to veins at the base of the neck, as during a sudden deep inspiration the direct aspiratory effect of respiration in the veins extends to some distance, thus constituting the direct cause of entrance of air into an open vein.

Before anaesthetics were used, Poiseuille advised that the patient should be instructed not to make any deep inspiratory movements during the operation. At the present time the same object is better obtained by keeping the patient thoroughly and continuously under the influence of the anaesthetic.

Gerdy aimed to prevent the aspiratory effect of respiration by recommending compression of the thorax, but the advice is more useful in theory than in practice, as suspension of the thoracic movements for any length of time would necessarily interfere with respiration, and cause death by asphyxia.



The venous circulation is greatly influenced by position. In the elevated position the blood gravitates towards the heart, and the veins are emptied. If in this position a vein is wounded and the walls of the vessel do not collapse on account of some anatomical peculiarities, or from rigidity of the vein wall itself, a vacuum is formed, and air enters. The entrance of air into a vein distended with blood is a physical impossibility. In reading the clinical histories of cases where air entered veins during operations, we are met by the fact, that in almost all of the cases the wounding of the vein was not followed by any considerable loss of blood, and we are usually told that the air entered almost immediately after the vessel was injured, which would indicate that the vein was empty, or nearly so, at the time it was wounded. In a number of cases the bloodless condition of the vein attracted the attention of the operator, and is particularly emphasized in the description of the cases. As long as the interior of a vein and the lumen of a wound in its walls are occupied by a continuous stream of blood, there is no danger that air will be admitted. Statistics tend to show that the accidental admission of air into veins was more frequent before anæsthetics were used—a fact which we can only explain by assuming that the patients were then usually placed in a sitting or semi-recumbent position during the operation, positions favorable to the return of venous blood from the cervical region. On the other hand, the safe administration of an anæsthetic necessitates the supine position in which the veins of the neck become distended with blood. In the former instance, the return of venous blood in the vessels of the upper portion of the body was favored by the elevated position, and the vacuity thus produced in the veins constituted the most important and potent factor in determining the entrance of air. In the supine position, the veins of the neck are never empty; and to effect entrance of air, the exciting cause must operate with increased intensity. On this account the supine or dependent position of the region of the body to be operated upon recommends itself as the simplest prophylactic measure against the accidental entrance of air into wounded veins. This position increases the risk of hemorrhage from the injured vein, but this accident in its immediate effects is less disastrous

to the patient and more readily under the control of the surgeon than air-embolism.

2. *Compression.* Compression of a vein between the seat of operation and the heart, for the purpose of guarding against the entrance of air, may be divided into intermediate and direct. Intermediate compression is only applicable in cases where the external jugular vein is in danger of being wounded. If the tumor to be extirpated is not located too low in the region of the neck, uninterrupted digital compression of the external jugular vein just above the clavicle can be relied upon in preventing entrance of air through this vessel. The internal jugular and axillary veins are so deeply situated that immediate digital compression cannot be relied upon in the prevention of air-embolism, consequently it becomes necessary to resort to direct compression whenever it is desirable to guard against this accident. Warren recommended that in the extirpation of tumors which are in close proximity to the large veins of the neck and axilla, the separation of the pedicle should be reserved until the last, in order to enable the operator to compress the vein between the seat of operation and the heart more effectually, should the vessel be injured during the operation. Langenbeck advised that the vein on the distal and proximal sides of the tumor should be exposed to sight as a preliminary measure, before attempting the removal of the tumor, with the view to facilitate direct compression, in case the vessel should be opened during the dissection. The adoption of this precaution would successfully prevent a second ingress of air, but would not protect the patient against the dangers arising from the first dose. Permanent central compression augments the danger of wounding the vein, from the turgidity of the vessel which it produces, while distal compression would be attended by the same risk, only in an opposite way, by rendering the vessel empty, and consequently more difficult of recognition. If the attachments of the tumor to the vein are of such a nature that they can be separated without great danger of injuring the vessel, then the vein should be isolated on the proximal side, and the vessel compressed with a hæmostatic forceps, which will afford greater safety than digital compression. At the same time, the field

of operation is not obscured and narrowed by the fingers and hand of the assistant—an item of great importance in operating in the regions of the neck or axillary space. Injury of the vein in such instances will be promptly announced by hemorrhage from the distal portion, but the entrance of air into the right ventricle is made impossible by the prophylactic compression of the vessel between the seat of operation and the heart. Should the vein be wounded, any further ill effects arising from the accident can be prevented by applying a lateral ligature, or tying both ends of the vein, according to the size of the wound, before removing the compressing forceps. In all operations, where any of the large veins are in danger of being wounded, the position of the parts should be such as to retain as nearly as possible their normal anatomical relation. The operator should make haste slowly, and identify every structure before using cutting instruments. In extirpating tumors that are deeply situated, the external incision should always be large, so as to afford free access to the base or deepest portion of the growth to be removed. A pair of Billroth's retractors will do good service during the deep dissection. Hemorrhage must be carefully arrested as it occurs, in order to enable the surgeon to see what he is doing. Isolation of the vein from the tumor must be accomplished by the use of blunt instruments, and all firmer attachments should be carefully examined and identified before using the knife or scissors. As it is usually impossible, or, at any rate, impracticable to find the vein in the tumor or its immediate vicinity, the rule should always be followed to expose the vessel for some distance from the tumor on the proximate side, and then follow it by carefully separating the attached tissues by means of blunt instruments. Under antiseptic precautions the jugular vein can be isolated for a great distance, without fear of compromising the vitality of its lumen or causing thrombosis. When a tumor is attached to the jugular vein, it is a dangerous practice to make traction on the tumor for the purpose of facilitating the deep dissection, as this procedure will disturb the normal anatomical relations of the vessel, and expose it to greater risk of being wounded. Free access to the base of the tumor must be secured without displacing the subjacent vein. As

soon as the tumor has been isolated from the surrounding tissues, a thorough examination should be made of the extent of its base, and its relations to the subjacent vein, before proceeding any further with the dissection. If the conclusion is reached that the vein is so intimately connected with the base of the tumor that it is in great danger of being injured during the further progress of the extirpation, it becomes necessary to resort to direct compression of the distal and proximal portion of the vein. By isolating and compressing the vein on each side of the tumor, both excessive turgidity and emptiness of the intervening portion of the vein are avoided. The amount of blood in the vein between the two points of compression can be regulated, and only a sufficient quantity is allowed to remain to indicate the exact location of the vessel. Compression is again made with hæmostatic forceps. After the complete removal of the tumor, the forceps on the distal side of the vein is removed first, in order to test the integrity of the vessel, and with a view to prevent any possibility of the entrance of air. If no hemorrhage takes place, we may be satisfied that the vein has not been injured, and the remaining pair of forceps can be safely removed. In such cases the exposed portion of the vein should always be covered with the adjacent tissues by deep sutures, *en étages* of catgut, before closing the wound. If the vein has been wounded, a lateral ligature is applied, or both ends are ligated after complete division of the vessel, before the forceps between the vein wound and the heart is removed. By following this plan we accomplish the following objects: 1. Hemorrhage from the injured vein is slight, and perfectly under the control of the surgeon. 2. Absolute security against the entrance of air. 3. A more thorough removal of the tumor.

3. *Ligation.* In all cases where a large vein passes through the substance of the tumor, and where isolation of the vessel appears inexpedient or impossible, double ligation recommends itself as the safest prophylactic measure against hemorrhage and air-embolism. As soon as the base of the tumor is reached, the vein is exposed on each side and tied with a catgut, and the intervening portion is extirpated with the tumor. By adopting this plan we secure for the patient absolute protection

against hemorrhage and air-embolism. Adequate collateral circulation is established in a short time, so that ligation or excision of the internal jugular or axillary veins can be done under antiseptic precautions, without danger of causing serious disturbance of the cerebral circulation in the former, or gangrene of the arm in the latter instance. Isolation and ligation of the vein on the proximal side of the tumor should always be resorted to, when injury to the vein is unavoidable. In case the prophylactic ligation of the vein on the distal side of the tumor is rendered difficult or impossible by existing circumstances, the following course can be pursued: After ligation of the vein on the proximal side of the tumor, a hæmostatic forceps is applied a little distance from the ligature on the side of the tumor, and the vessel is divided between the forceps and the ligature. The ligature prevents the entrance of air, and the forceps serves the purpose of a temporary hæmostatic agent during the extirpation of the tumor. The base of the tumor with the vein is detached, when the vessel on the distal side of the tumor is sought for and tied, and the remaining attachments of the tumor, including the vein, are cut. This plan affords protection against the entrance of air, but during the separation the tumor troublesome hemorrhage may occur from accidental wounds of the distal portion of the vein, which, however, can be readily controlled by compression with hæmostatic forceps until the vessel is permanently secured on the distal side of the tumor.

4. *Aseptic Tampon.* If a large vein has been wounded, which, from its location, is inaccessible to the ligature, permanent compression with a graduated aseptic tampon will arrest the hemorrhage and prevent further ingress of air.

#### OPERATIVE TREATMENT OF AIR-EMBOLISM.

Considering the infrequency of air-embolism, as compared with the number of vein wounds, it is not surprising to find that, as a rule, surgical writers have little, if anything, to say on the subject of the prevention and treatment of air-embolism. It must be apparent to all that, in following the rules laid down when we considered the prophylactic treatment, the accidental

introduction of air into veins is prevented almost to a certainty. At the same time, they will also furnish a safe guide in the prevention and management of venous hemorrhage, when operating within the area of the "danger zone." If the preventive treatment is carefully carried out, air-embolism will become one of the rarest accidents in surgery.

As even with the greatest care an accident of this kind might happen, it is necessary to allude to the operative treatment of air-embolism. The occurrence of the accident is sometimes announced by an audible hissing or sucking sound, and is always followed almost instantly by a well-marked train of distressing symptoms, which are directly referable to a mechanical obstruction to the circulation in the right side of the heart and the pulmonary artery. The treatment must depend on the quantity of air which has entered, and the severity of the symptoms produced by it. The therapeutic measures should be aimed towards meeting the following indications: 1. Prevention of further ingress of air. 2. Administration of cardiac stimulants. 3. Venesection. 4. Aspiration of air from the right side of the heart.

1. When air has entered through a gaping wound in a vein during inspiration, there is great danger that the same occurrence will repeat itself during successive respiratory movements of the chest; hence, the first object of treatment consists in closing the wound in the vein. This is most quickly done by digital compression, which is continued until the vein has been rendered impermeable by ligature or permanent compression. If the symptoms are urgent, no time should be lost in securing the vessel, until the patient has rallied from the immediate effects of the air embolism. It is also necessary to postpone the permanent closure of the vein until the time has elapsed for any indications to arise which would call for venesection, or operative removal of the air from the right side of the heart, as in such cases it may become necessary to utilize the wounded vein as a route for the introduction of a catheter into the heart. When the time has arrived for closing the vein, the finger should not be removed suddenly from the vessel, for fear of causing a repetition of the accident; it should remain *in situ* until the vessel can be compressed on the prox-

imal side of the vein wound by an assistant. The exact location of the wound will now be probably indicated by escape of blood from the distal end of the vein, when the vessel can be seized with forceps, and, after its isolation, a double ligature is applied. If it is found impossible to ligate the vein, then the vessel is compressed in the wound by means of a graduated aseptic tampon, retained in place by uninterrupted pressure until definitive closure has taken place.

2. The heart's action must be supported by position and by the use of cardiac stimulants, which are best administered subcutaneously and by inhalation. The patient must be placed in the supine position, with a view of guarding as much as possible against the occurrence of cerebral anæmia, as well as to lessen the intravascular pressure to a minimum. If the quantity of air admitted is not sufficient to produce instant death by paralysis of the right side of the heart in the diastole, the symptoms which follow always point towards an embarrassment of the circulation in the right side of the heart and the pulmonary artery, which are always accompanied by dyspnœa, and combined with evidences indicating the existence of acute cerebral ischæmia. If death does not take place within a few minutes from obstruction to the circulation through the pulmonary artery, by the presence of air in that vessel, then the contractions of the right ventricle will force at least a part of the air through the pulmonary capillaries into the general circulation, thus preventing death by asphyxia. As soon as the air-embolism of the pulmonary artery has been relieved, the most urgent symptoms subside, as the air-emboli in the arterial system are distributed over a larger area, and consequently produce an embolism of lesser extent and gravity in more distant and less essential organs. The safety of the patient depends on the capacity of the right ventricle to force the air through the pulmonary into the general circulation—in other words, upon the time which is required in removing the emboli from the pulmonary artery into the systemic circulation.

Nitrite of amyl, from its stimulating properties upon the heart, and from the rapidity of its action, would recommend itself, in the form of inhalation, as the most efficient drug in preventing threatened syncope. The temporary dilation of the

small blood-vessels would tend to produce, at least for a short time, a diminution of the intravascular pressure. Hypodermatic injections of camphor and alcohol, although slower in their action, would also assist in antagonizing the deleterious effect of over-distension of the right ventricle by the air-embolus. In all my experiments where electricity was used, it had no effect whatever upon the heart, even when applied directly to the organ; hence, it would be of no use to resort to this agent for the purpose of sustaining or re-establishing the movements of this organ in serious cases of air-embolism.

3. In all post-mortem examinations, after sudden death from air-embolism, two constant pathological conditions are always found present: 1. A comparatively empty state in the left side of the heart and throughout the entire arterial system. 2. Distention of the right ventricle, and intense engorgement of the whole venous system. Both of these conditions are, of course, due to the presence of air in the ultimate branches of the pulmonary artery, which prevents the free transit of the venous blood through the pulmonary capillaries into the left side of the heart. As a direct result of these conditions, we have a diminution of the intravascular pressure in the left side of the heart and arteries, and a corresponding increase in the right side of the heart and the veins. The immediate and greatest danger arises from an accumulation of air and blood in the right side of the heart to such an extent as will arrest the ventricular contractions by over-distension before the equilibrium between the arterial and venous circulation can be restored by the removal of the air-emboli from the pulmonary artery into the general circulation. Even the most extreme antagonists to the lancet must acknowledge the benefit which follows its use in similar conditions of the circulation caused by other pathological conditions. In severe cases of pneumonia, where the circulation has been so much obstructed that death is threatened by venous engorgement and over-distension of the right ventricle, the free use of the lancet is the safest and most efficient means in equalizing the circulation, as, by the abstraction of blood from one of the veins, the intravascular pressure in the veins and right side of the heart is diminished in the promptest and most direct manner.



As the adventitious air in the pulmonary capillaries can and will be forced into the general circulation by the contractions of the right ventricle, and as the urgent symptoms will subside after this has taken place, it is of paramount importance to gain time by protecting the right ventricle against an undue amount of additional labor. Among the indirect remedies to accomplish this object, venesection deserves the first place. I could refer to a number of the experiments where copious bleeding from the distal portion of the open vein was promptly followed by improvement in all the symptoms. Vulpian asserted that, after insufflation of air into veins, the contractions of the heart were restored after the organ had ceased pulsating, by the abstraction of blood from the sinuses of the brain and the veins of the neck. I have never succeeded in restoring the action of the heart, after its pulsations had ceased completely, by any kind of treatment; but, when the contractions have become imperfect from this cause, I know that removal of the cause of over-distension will restore the force and efficiency of the contractions. H. Fischer (*Ueber die Gefahren des Luftetrtritts in die Venen*, p. 17) sarcastically alludes to this valuable agent in the treatment of air-embolism as a remedy from which only homœopaths would expect to derive any benefit. An expression of this kind, concerning such a valuable remedy, and in this particular connection, must be looked upon as unscientific and contrary to well established clinical and pathological facts. I must, therefore, insist that venesection from the distal end of the wounded vein will prove beneficial in all cases of air-embolism where venous engorgement and over-distension of the right ventricle constitute elements of imminent danger. If practicable, the bleeding should always be done from the distal end of the wounded vein, while the proximal end is compressed or ligated. The advantages of doing so are obvious for the following reasons:

(a) The abstraction of blood is accomplished in the shortest possible space of time.

(b) The blood escapes in a large stream from a capacious vessel.

(c) No additional instruments are required, and the infliction of another wound is obviated.

4. Clinical experience and experimental research teach us, that when a certain amount of air enters the right side of the heart, death invariably takes place in a very short time, and cannot be prevented by any of the indirect methods of treatment. It seemed to me that in such cases it would be legitimate and proper for the surgeon to resort to some procedure by which the air could be removed directly from the heart. To accomplish this object, Fischer recommends that forcible expiratory movements should be excited by inducing coughing, sneezing, or vomiting, with a view that during the forcible compression of the thorax the aspirated air would be forced out through the wound in the vein. Against this advice the following objections may be entered: 1. The difficulty or impossibility of exciting coughing, sneezing, vomiting or any other act on the part of the patient, when in a condition of collapse. 2. If during the forcible compression of the chest the air is forced backwards, it will be just as likely to pass into other veins than the one through which it entered. 3. The difficulty of preventing the admission of more air during the forcible inspiration following the forcible expiration. 4. During prolonged forcible expiration the intra-vascular pressure in the veins and right side of the heart is greatly increased, thus constituting an additional source of immediate danger. 5. Forcible expiratory movements of the thorax, by compressing the heart, will be more likely to force the air onward with the venous current into the pulmonary artery, where it will do the most harm by causing asphyxia from a sudden and extensive air-embolism in that vessel.

The only direct means of removing air from the heart consists in puncture of the right ventricle and catheterization of the right auricle combined with aspiration. The experiments made by myself in this direction have demonstrated that puncture of the right ventricle with an aseptic needle two millimetres in diameter is in itself a harmless procedure. When we remember that in the human subject the heart has often been the seat of more extensive injury without any immediate or remote ill effects, we must abandon the idea that slight injuries of this organ are necessarily fatal. Small aseptic wounds of the heart heal rapidly and in the same manner as in

any other organ of the body. The hearts, which I show you, were removed from dogs a few days to three weeks after puncture, and not in a single specimen are we able to detect any evidences of organic changes either in the substance of the organ or its serous membranes. In most of the specimens the point of puncture is marked by a minute cicatrix visible upon the surface of the visceral pericardium. In penetrating wounds of the heart, hemorrhage into the pericardium and compression of the heart from this cause are to be feared, and constitute the only source of immediate danger. There is no plausible reason why, in the human subject, an oblique puncture of the right ventricle should be followed by more hemorrhage than in animals, and consequently I have no hesitation in recommending puncture and aspiration of the heart as a justifiable procedure in cases of air-embolism which would otherwise necessarily prove fatal. The question naturally arises: What symptoms indicate a resort to puncture and aspiration of the right ventricle? Two different conditions, as far as time and symptoms are concerned, may call for this operation. The puncture should be made as soon as possible after the entrance of air in the event that the primary effect of the heart embolus has produced sudden over-distension and paralysis of the right ventricle, an occurrence which would be indicated by immediate collapse and partial or complete suspension of the heart's action. In such a case, the direct withdrawal of air from the right ventricle as soon as possible after its entrance affords the only possible hope of restoring the pulsations of the heart by removing the cause of the mechanical over-distension. In the second class of cases the patient has collapsed, but the heart has withstood the primary effect of the aspirated air. The heart's action is rapid and tumultuous, perhaps at times intermittent. The ear applied over the cardiac region detects distinct churning sounds. Respirations are rapid, and all symptoms point towards imperfect circulation and æration of the blood, as expressed by the pallid face and blue lips. Some of the air has passed from the right side of the heart into the pulmonary artery, and, from the obstruction of the circulation through this vessel, the right ventricle becomes more and more distended, the contractions therefore are less perfect

and more frequent. At this stage of things puncture and aspiration of the right ventricle will overcome the most urgent symptoms by the removal of air and spumous blood, and enough time may be gained for the right ventricle to force the remaining air emboli through the pulmonary capillaries into the general circulation, and the life of the patient is saved. These are the cases where puncture and aspiration of the right ventricle can be done with a fair prospect of not only relieving urgent symptoms, but of ultimate recovery. They are also more favorable from the fact that more time is afforded the surgeon in procuring and using the aspirator. The puncture should always be made in an oblique direction from below upwards, so as to make a valvular track in the heart, for the purpose of preventing hemorrhage into the pericardium, and also for giving the point of the needle a direction in which it is least likely to injure the opposite endocardial lining. The left intercostal space between the fourth and fifth ribs, about an inch and a half from the margin of the sternum, is selected as the best point for making the puncture. The needle, thoroughly disinfected, is connected with the aspirator, and, as soon as its point is buried in the tissues, a vacuum is created in the aspirator, and the needle is advanced slowly until spumous blood is felt and seen to escape, when it is firmly held in this position and the contents of the ventricle are withdrawn as quickly as possible.

My experiments have satisfied me that I generally removed the needle too soon, not having withdrawn a sufficient quantity of blood and air. In some of the experiments I followed the aspiration by blood-letting with marked benefit. Removal of the same quantity of blood directly from the right auricle would have been productive of more good, as less air would have been left in the heart. The experiments on dogs have shown that these animals will always recover if the quantity of air injected into the veins does not exceed one cubic centimetre of air to each pound of its weight. Double this quantity must be considered a fatal dose. If, therefore, we can remove by aspiration only a portion of air directly from the right ventricle, we may be able to maintain the action of the heart and respiration until the embolism of the pulmonary

artery has been relieved by the passage of air from this vessel into the general circulation. When the presence of a foreign body in any other part of the body threatens to destroy life, no surgeon would hesitate to attempt to remove it, even if the effort should be attended by an increase of the immediate risk. Air in the right side of the heart acts the part of a foreign body, and when it destroys life, it does so by causing mechanical obstruction to the circulation. The timely removal of this foreign body is the only rational treatment in all cases where simpler measures have proved inadequate in preventing a fatal termination. An aspirator, in good condition, should be on hand in every well regulated hospital, and of ready access in cases of emergency. Should air-embolism occur during an operation, the instrument might be on hand and ready for use before the heart has ceased pulsating, when prompt action on the part of the operator might obviate death in an otherwise hopeless case. The experiments on catheterization of the heart were undertaken with a view to simplify the operative removal of air from the right side of the heart.

An aseptic catheter was introduced into the wounded vein and passed into the right auricle, and, by aspiration, air and spumous blood were removed. The result showed that some of the animals were saved from impending death by this simple procedure. The great danger attending this operation consisted in the tendency of the blood to coagulate within or around the distal end of the catheter, and death from the formation of a thrombus in the large veins and right side of the heart. If the formation of a thrombus could in some way be prevented with certainty, catheterization and aspiration of the heart would recommend itself as the simplest and safest measure in the operative treatment of air-embolism.

Catheterization of the heart is not a new suggestion, as the introduction of a tube into the heart, for the same purpose, was recommended more than fifty years ago by Magendie. I should recommend the adoption of this procedure only in case when the air has entered through a wound in the internal jugular, and when the symptoms leave no doubt that death would be inevitable without direct removal of the air by aspiration. An aseptic Nélaton's catheter with an open end

should be introduced into the wound, through which the air entered, and pushed as quickly as possible as far as the auricle, when the air and spumous blood can be withdrawn by the mouth in the absence of any other means of aspiration. Admission of more air is prevented by compression of the distal end of the instrument before and between the aspirations. The whole operation must be done as quickly as possible for the purpose of preventing coagulation of the blood. For the same reason an instrument of large calibre should be used.

In presenting to you the practical outcome of my experimental work in the form of these few suggestions on the operative treatment of air-embolism, I am fully aware that, in your own minds, you have decided that my labor has been in vain, and that the means suggested do not admit of application in practice. In reply, I will say, that desperate cases call for desperate measures. When death stares us in the face we have not only a right, but it becomes our most imperative duty, to resort to any plan of treatment which holds out the slightest hope of saving the life of the patient. For myself I am fully convinced of the safety and usefulness of puncture and aspiration of the right ventricle in grave cases of air-embolism, where simpler means have proved of no avail. When no aspirator is within reach, I also believe in the propriety of catheterization and aspiration by the mouth, of the heart, as a last resort in all cases of air-embolism where death would surely take place without it. If, by the adoption of either of these methods of direct treatment of air-embolism, a single human life should be saved, I shall feel amply rewarded for the labor incurred in the preparation of this paper.

In conclusion, I beg leave to submit the following *résumé* for your further deliberation and discussion:

(1.) The presence of adventitious air in the vascular system during life gives rise to air-embolism.

(2.) Each air embolus constitutes a mechanical source of partial or complete obstruction to the flow of blood in the vessel in which it is located.

(3.) Aspiration during the inspiratory movements of the chest is the direct or exciting cause of ingress of air into a wounded vein or sinus.

(4.) Elevation of the head is the sole predisposing cause of the entrance of air in wounds of the superior longitudinal sinus.

(5.) In veins the predisposing causes consist in (a) Elevation of the part wounded. (b) Pathological or anatomical conditions which prevent collapse of the vein when it is wounded.

(6.) Insufflation of a fatal quantity of air into a vein produces death by (a) Mechanical over-distension of the right ventricle of the heart and paralysis in the diastole. (b) Asphyxia from obstruction to the pulmonary circulation consequent upon embolism of the pulmonary artery.

(7.) Insufflation of the same quantity of air into arteries is less dangerous than when introduced into veins. When death is produced in this manner it results from—

(a) Acute cerebral ischæmia.

(b) Secondary venous air-embolism.

(c) Intense collateral engorgement of the vessels of the brain and spinal cord, the manner of death being determined by the amount of air injected, and the direction in which the injection is thrown, as well as the time which has elapsed between the operation and the fatal termination.

(8.) Air injected into arteries is readily forced through the systemic capillaries into the venous circulation and right side of the heart by the powerful contractions of the left ventricle.

(9.) Air-embolism of the pulmonary artery is relieved in a comparatively short time, provided the contractions of the right ventricle continue unimpaired for a sufficient length of time to force the air through the pulmonary capillaries into the general circulation.

(10.) The prophylactic treatment consists in proximal or double compression, or ligation of the vein which is endangered by the operation.

(11.) The indirect treatment has for its objects—

(a) Prevention of admission of air.

(b) Administration by inhalation of hypodermatic injection of cardiac stimulants.

(c) Venesection.

(12.) The direct or operative treatment by—

(a) Puncture and aspiration of the right ventricle.

(*b*) Catheterization and aspiration of right auricle, which is proposed with a view to obviate the direct cause of death by the removal of air and spumous blood, thus relieving directly the over-distension of the right ventricle, and, at the same time, to guard against a fatal embolism of the pulmonary artery.

(13.) The results obtained by experiments on animals warrant the adoption of the operative treatment of air-embolism in practice, as a last resort, in all cases where the direct treatment has proved inadequate to meet the urgent indications.

## THE FIELD AND LIMITATION OF THE OPERATIVE SURGERY OF THE HUMAN BRAIN.

[Concluded from p. 129.]

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I HAVE now with great detail discussed what I conceive to be the principles of the operative surgery of the human brain. It remains to apply these principles to the treatment of:—

- A. Cranial fractures.
- B. Intracranial hemorrhage.
- C. Intracranial suppuration.
- D. Epilepsy following cranial injury.
- E. Insanity following cranial injury.
- F. Cerebral tumor.

A. In discussing the treatment of cranial fractures, I shall ask myself four questions:

1. What conditions demand incision of the scalp?
2. What conditions render incision of the scalp unjustifiable?



3. What conditions demand perforation of the skull?
4. What conditions render perforation of the skull unjustifiable?

These queries are best answered by the tabulated statement which follows. I admit that the line of treatment advocated is more heroic than that generally taught, but it has been accepted only after careful consideration of the reasoning of those who hold the opinion opposite to my own. Every case must be individually studied, and the patient's chances of death, of life with subsequent epilepsy or insanity, or of return to perfect health, carefully weighed; but for a working rule to guide the student and practitioner, I think experience will show that the indications given in the table are correct. Trephining, when properly performed, is in itself so free from danger that in a doubtful case the patient had better be trephined than allowed to run the risk of death, epilepsy or insanity. Legouest was very nearly right when he said: "Whenever there is a doubt whether trephining should be done, this doubt is probably an indication that operation should be performed."<sup>1</sup>

#### SYLLABUS OF THE TREATMENT OF FRACTURES OF THE CRANIUM.

##### CLOSED FISSURED FRACTURES.

1. No evident depression, no brain symptoms. No operation.
2. No evident depression, with brain symptoms. Incise scalp and trephine.
3. With evident depression, no brain symptoms. Incise scalp, and possibly trephine. (See note below.)
4. With evident depression, with brain symptoms. Incise scalp and trephine.

##### CLOSED COMMINUTED FRACTURES.

5. No evident depression, no brain symptoms. Incise scalp and probably trephine. (See note below.)
6. No evident depression, with brain symptoms. Incise scalp and trephine.
7. With evident depression, no brain symptoms. Incise scalp and trephine.

<sup>1</sup> Lucas-Championnière, *Trepanation guidée par les localisations cérébrales*, p. 23.

8. With evident depression, with brain symptoms. Incise scalp and trephine.

#### OPEN FISSURED FRACTURES.

9. No evident depression, no brain symptoms. No operation, but treat wound.

10. No evident depression, with brain symptoms. Trephine.

11. With evident depression, no brain symptoms. Possibly trephine. (See note below.)

12. With evident depression, with brain symptoms. Trephine.

#### OPEN COMMINUTED FRACTURES.

13. No evident depression, no brain symptoms. Probably trephine. (See note below.)

14. No evident depression, with brain symptoms. Trephine.

15. With evident depression, no brain symptoms. Trephine.

16. With evident depression, with brain symptoms. Trephine.

#### PUNCTURED AND GUNSHOT FRACTURES.

17. In all cases and under all circumstances, trephine.

[NOTE—In classes 3 and 11, I should be inclined to trephine, if the depression was marked, or the fissure sufficiently multiple to approach the character of a comminuted fracture. In classes 5 and 13, I should trephine, unless the comminution was found to be inconsiderable.]

The operation, when decided upon, should be performed at once, or certainly not delayed more than a few hours.

All cases, whether trephined or not, should be treated as cases of incipient inflammation of the brain.

*B.* In deciding upon operative treatment of intracranial hemorrhages, two questions are to be answered:—

What symptoms render perforation of the skull, in order to remove the clot and secure the bleeding vessels, unjustifiable?

What symptoms demand such operation or render it justifiable?

Intracranial hemorrhages occur between the cranium and dura mater, in the cavity of the arachnoid, in the meshes of the pia mater, in the substance of the brain, and in the ventricles. Hemorrhages within the ventricles, or in the substance of the brain, whether traumatic or idiopathic, must, with our

present knowledge, be treated solely by medical means; though I consider it not impossible that medical science may in time teach us to locate and diagnosticate such lesions with a precision that may justify exploratory and therapeutic operations in a limited number of cases. Blood poured out in the meshes of the pia mater is usually associated with laceration of the brain, and spreads so widely over the surface of the convolutions that it is impossible to locate the origin of the bleeding, or to remove the distributed blood. Hence, operation is contraindicated in cases of intracranial bleeding that do not present the symptoms which are believed to be produced by accumulation of blood in either the cavity of the arachnoid or the space between the skull and the dura mater.

The differential diagnosis between circumscribed hemorrhage within the arachnoid cavity and circumscribed hemorrhage between the dura and cranium is practically impossible, though it is said that marked inequality of the pupils and marked hemiplegia are less noticeable in arachnoid extravasation than in subcranial extravasation. If localized hemorrhage within the arachnoid is reasonably ascertained, trephining with incision of the dura is, in my opinion, justifiable. After the bone is removed, the bluish and non-pulsatile dura will probably bulge into the opening, and should be incised to allow escape of the blood. Nancrede<sup>1</sup> refers to cases where the bulging of the dura did not occur until many hours had elapsed.

It is not likely that any special vessel will require ligation or similar treatment in arachnoid hemorrhage, as does occur, not infrequently, in subcranial hemorrhage, where the bleeding often comes from a large meningeal artery or a venous sinus.

Hemorrhage between the dura and cranium (subcranial extravasation) is not very unusual as an accompaniment of head injuries, because the branches of the large middle meningeal artery ramify over the inner surface of the parietal bone, which from its position so often bears the brunt of the vulnerating force. Indeed, the artery is sometimes, especially at the lower anterior angle of the bone, enclosed in a bony canal, so that fracture of the bone at that point almost insures the laceration

<sup>1</sup> *International Encyclopedia of Surgery*. Vol. 5. P. 51.

of the artery. The venous sinuses are also torn or wounded at times, and cause subcranial extravasation. Hemiplegia on the side opposite the extravasation, rapidly followed by general paralysis and coma, is frequently seen in subcranial hemorrhage. Convulsions during the time of bleeding occur, though not very frequently.

In bleeding from the middle meningeal artery, the clot often causes pressure at the base of the skull, and, therefore, may, by pressure on the cavernous sinus and the nerves going to the eye, cause on the side of injury, protrusion of the ball and dilatation of the pupil, or wider dilatation than in the other eye; while the hemiplegia, from cortical pressure, will be on the opposite side. If a fissure exists, the blood may escape into the temporal fossa of the injured side, and cause tumefaction there. Erichsen<sup>1</sup> records two cases where these symptoms were a valuable aid in diagnosis. Such symptoms, as well as embarrassment of respiration, indicate operation. When the blood lies within the brain, because due to cerebral laceration, the patient has, if the laceration is at all severe, no interval of consciousness after the injury; concussion symptoms soon give place to compression symptoms; and paralysis is not complete as a rule, and is apt to be limited to hemiplegia. Twitching of the limbs, convulsions of the body, restlessness, muttering incoherence, contracted or irregularly dilated and contracted pupils, with perhaps squinting, are the prominent symptoms which occur.

The diagnosis of traumatic subcranial hemorrhage, and, indeed, in a surgical sense, the same may be said of arachnoid hemorrhage also, centres upon the absence of the characteristic symptoms of laceration, just given, and upon the fact that the group of symptoms, commonly called "compression of the brain," occur not immediately after the injury, as in laceration of the brain or hemorrhage into the ventricles or brain substance, but later—that is, after the interval of a few minutes or hours. For example, a man is struck on the head, and falls stunned, but soon recovers consciousness, though subsequently he becomes comatose and paralyzed on the side opposite the

<sup>1</sup> *Science and Art of Surgery*. Vol. I. P. 735.

injury. Here the presumption of a subcranial or arachnoid hemorrhage having occurred, as soon as reaction has sent enough blood to the head to distend the torn vessel, is very great. This period of immunity from head symptoms, after traumatism, is sufficient to justify operative search, when an injury or such symptoms as coma, dilated pupil, hemiplegia, monoplegia or monospasm sufficiently localize the effusion; or if the symptoms are increasing or are of sufficient severity to point to the probability of active encephalitis. Apoplexy, drunkenness, opium-poisoning, uræmic coma and intracranial hemorrhage are often to be differentiated in cases without history. The problem is frequently difficult. Reference has been made, on p. 123, to Dr. Seguin's suggestion regarding the diagnosis of latent apoplectic paralysis.

A very short interval indicates rapidly flowing hemorrhage, and demands early operation, with probable ligation of the middle meningeal artery or one of its large branches, or ligation or compression of a sinus. It must be remembered, also, that compression symptoms, coming on immediately or quite soon after depressed cranial fracture, are very often due to the subcranial clot, rather than the depressed bone. Removal or elevation of bone is often needed more for liberation of blood-clot and control of hemorrhage than because of deformity in the bony outline.

Rapid hemorrhage will probably be from the middle meningeal artery, and, therefore, a large trephine should be put over the anterior inferior angle of the parietal bone and the squamous portion of the temporal bone just below that angle, unless the localizing symptoms direct to some other point. Inspection of the skull will show that the two large branches of this artery, as they ascend to distribute branches to the lateral region of the cranium, can both be uncovered by a large trephine applied to this point.

This point is situated about  $1\frac{1}{2}$  inches behind the external angular process of the frontal bone, and one inch above the zygoma; or  $1\frac{1}{2}$  inches directly above the condyle of the jaw.

The rules given by Keen and Erichsen<sup>1</sup> are accurate for un-

<sup>1</sup> Holden's *Medical and Surgical Landmarks*. Edited by W. W. Keen. Phila. 1881. P. 18. Erichsen's *Science and Art of Surgery*. Vol. I. P. 739.

covering the superior branch, but place the trephine, I think, a little too high, if the two branches are to be uncovered at their point of divergence. There are probably variations of the point of bifurcation. The bleeding vessel, when found, may be ligated or twisted, or the bony canal plugged with a piece of stick or wax, or the actual cautery applied by means of a red-hot needle. (See cut on p. 127.)

Nancrede<sup>1</sup> has collected forty cases of operation of this kind, with 24 recoveries and 16 deaths. Early operation gave, as might be expected, a much better percentage of recovery than those in which operation was delayed.

The tendency has been to deter surgeons from operating in intracranial extravasations, unless the certainty of diagnosis was great. For example. Gross says:<sup>2</sup> "The only case in which such a procedure is really warrantable is where the extravasation is associated with, or dependent upon, fracture of the skull, complicated with depression, or serious injury of the soft parts, or where the fracture is situated directly over the course of the middle meningeal artery." This advice is, in my opinion, too restrictive. Gradually increasing brain symptoms, after head injury, especially if there has been a period of return to consciousness after the shock of traumatism, suggests the occurrence of intracranial bleeding from meningeal vessels, even when no fracture or depression of bone is detectable. Operation is then especially indicated, if the localizing symptoms point to no other region of the cortex and if symptoms such as described above, on page 218, do not render cerebral laceration probable.

C. I come now to the operative treatment of intra-cranial suppuration.

I believe that operative evacuation should be undertaken in all cases of localized intra-cranial suppuration, whether the abscess is sub-cranial, intra-meningeal, or cerebral.

Ashhurst<sup>3</sup> and some other authorities rather deprecate operation, because patients have lived a long time with cerebral abscess in a quiescent encysted state; and perhaps also because

<sup>1</sup> *International Encyclopedia of Surgery*. Vol. V. P. 48.

<sup>2</sup> *System of Surgery*. Ed. 1882. Vol. II. P. 55.

<sup>3</sup> *Principles and Practice of Surgery*, p. 326.

autopsies have in rare instances shown what appear to be abscesses of the brain cured by caseation. The tendency, however, of intra-cranial suppuration, whether diffuse or localized, is known to be toward death. Cerebral  $\alpha$ -dema by progressive invasion of vital centres, rupture of the abscess into the ventricles, and extension to the surface of the base where fatal meningitis occurs are the usual modes of destroying life. Spontaneous evacuation through the nares, orbit, ear, or bony wall is too rare to be expected in any given case. Absorption, as far as we know, never occurs.

The difficulty in every case is that of establishing a diagnosis of pus and of proving that the pus, if present, is not a diffused meningeal exudation on the surface of the brain. The occurrence of symptoms indicative of intra-cranial suppuration within a few days of the receipt of a cranial injury usually means diffuse meningeal suppuration and contra-indicates efforts at evacuation. Symptoms of intra-cranial suppuration occurring at a later period are more apt to be due to abscess in the cerebral tissue or to a localized pus-collection between the bone and the membranes, and therefore indicate more decidedly the propriety of operation with a view to evacuation.

Intra-cranial suppuration, such as may be benefited by operation, provided that the exact situation of the pus can be diagnosticated, is apt to present a combination of some of the following symptoms:—

1. Headache, or a subjective sense of pressure on the brain. The headache is perhaps usually dull, and when present is quite constant.
2. Giddiness, nausea, or even vomiting.
3. Mental hebetude, dullness of senses, slowness in speech and movements, aphasia, mental irritability, muttering delirium, increasing imbecility.
4. Constipation.
5. Paresis, sensory abnormalities.
6. Sleeplessness, optical delusions, attacks of terror.
7. Chills.
8. General convulsive seizures of an epileptiform character; sometimes in a few cases localized convulsions.

9. Little, if any, elevation of general bodily temperature.
10. Perhaps localized increase of surface temperature of the head.<sup>1</sup>

At a later period there will occur most probably—

1. Hemiplegia.
2. Perhaps active delirium, severe headache, high temperature, especially if meninges become involved secondarily.
3. Coma.
4. Passive retinal congestion.
5. Involuntary evacuations.
6. Slow and full pulse, dilated or sluggish pupils.
7. Respiratory failure.
8. Death. —

The symptoms of chronic abscess may be so insidious as to escape notice of all except a very careful observer. It has been said that there are at times no symptoms. This I doubt, believing that a critical examination will detect them, especially if the observer be trained in investigating nervous diseases, and be sufficiently intimate with the patient to have known his previous habits and mental characteristics.

Puffy swelling of the scalp and separation of the pericranium with dry and yellow bone beneath it, seen at the bottom of a head wound, will in some few cases be found, and with general symptoms of pus become a clear evidence of abscess beneath the bone at that spot. Symptoms such as just mentioned demand trephining. If the pus is not found beneath the bone and the dura is pulseless and bulging, that membrane should be incised. If no pus is discovered and the general symptoms of intra-cranial abscess are marked, exploratory puncture and aspiration of the brain should then be performed.

In some cases surface thermometry may indicate the point on the cranium nearest the focus of suppurative encephalitis.

Nancrede<sup>2</sup> believes that when an intra-cranial abscess involves cerebral tissue alone the general bodily temperature is subnormal, or at least it is not an elevated temperature. He

<sup>1</sup> The suggestions of Flitner to measure the temperature of the external auditory meatuses by a properly constructed thermometer, might be utilized. See *Journal of American Medical Association*, November 15, 1884.

<sup>2</sup> *International Encyclopædia of Surgery*, Vol. V., p. 86.



looks upon high temperature as an evidence of localized suppurative arachnitis or of meningitis in addition to the cerebral abscess. Cerebral abscess, secondary to bone disease, would, of course, be liable to present an elevation of temperature, because meningitis was an early concomitant.

If a majority of the symptoms tabulated as accompanying intra-cranial abscess exist, and there has been received an injury on the side of the head opposite the hemiplegia, to which the supposed abscess can with reason be attributed, an exploratory operation should be done at the point of injury.

If the said symptoms exist and the principles of cerebral localization indicate any special region of the cortex or brain substance, an exploratory operation should be done on that part of the skull that affords best access to the supposed seat of lesion.

Incision of the membranes and exploratory puncture of the brain substance with aspirating tubes to the depth of three or more inches in various directions is justifiable if the symptoms of abscess are undoubted. The abscess cavity or cavities, when found, should be drained by free openings and counter-openings and drainage tubes, and should even be washed out by hydrostatic irrigation, if it is probable that there are pockets in which pus may remain and decompose.

Scarcely any limitation should be dogmatically given regarding the operative search for pus in undoubted abscess of the cerebral tissue, so long as the aspirating tube is not thrust deeply towards the vital centres located in the medulla oblongata and base of the brain. It is never too late to seek for the pus, for Nancrede<sup>1</sup> gave a patient several days of life after he was thought by several competent observers to be dead, by promptly incising a cerebral abscess. The earlier the operation is done the better; but it is never too late to make the attempt at evacuating an intra-cranial abscess.

*D.* In epilepsy following injury much good may at times be effected by removal of the cranial wall at the site of traumatism.

An internal spicule or osteophyte, from depressed or chron-

<sup>1</sup> *International Encyclopedia of Surgery*, Vol. V., p. 84.

ically inflamed bone, penetrating or pressing upon the membranes, thickened bone, pathological changes in the membranes themselves, the existence of a sequestrum of necrotic bone, depressed and neuralgic cicatrices of the soft parts, and similar kinds of irritation may be the exciting cause, giving rise to epilepsy in patients whose convulsive centres are especially irritable. Briggs has seen cases of epilepsy in which narrow spurs of bone nearly a half inch long grew from the inner surface of the skull.<sup>1</sup> Removal of the cause by operation is in such cases certainly demanded. Epilepsy due to peripheral irritation of a cicatrix in the scalp without bone lesion, may be relieved by dissecting out the scar tissue or detaching it as a flap from the bone, and allowing healing by granulation to occur. The application of the actual cautery to the scar may perhaps destroy the focus of irritation; though in a case where I tried this method no relief was obtained.<sup>2</sup>

Cauterization or excision of scar tissue should be attempted in traumatic epilepsy, therefore, before resort is had to trephining, except, perhaps, in cases where there is an evident accentuated depression of the bone. Then the irritating cause of the convulsions is not likely to be in the soft tissues alone. The subject of trephining in epilepsy was so ably and thoroughly handled at the last meeting of the Association by our present President, Dr. Briggs,<sup>3</sup> that I shall do little more than repeat some of his statements, and add a few thoughts which may serve to impress the Fellows with the importance of the topic, and cause them to again read his valuable paper.

The development of epileptic convulsions requires, first, a persistent abnormal excitability of the centres in the medulla oblongata and pons Varolii; and secondly a peripheral irritant. The latter is the exciting cause, and may be hard to discover in any given case. Traumatism often furnishes the peripheral irritant in the existence of a sensitive scar in some part of the head or body, or a cranial lesion irritating the cerebral membranes or brain. The hyper-excitability of the medulla and pons may be inherited, or acquired through personal acci-

<sup>1</sup> See Duret's paper on Dura Mater to which reference is made on p. 128.

<sup>2</sup> See *Transactions American Surgical Association* (1884), p. 132.

<sup>3</sup> *Transactions American Surgical Association*, 1884.

dental causes. Echeverria<sup>1</sup> attributes ten per cent. of all epilepsies to injuries of the head; but it must be remembered that the convulsions may not be developed for years after the injury. Briggs has seen cases in which ten years had elapsed; and quotes a case of Dudley's which developed sixteen years after injury, and was entirely cured by trephining. I must admit, however, that Althaus<sup>2</sup> has stated that fourteen years experience in a hospital devoted to epilepsy has taught him that traumatic epilepsy is rare. If operative treatment is instituted for traumatic epilepsy all the diseased or depressed bone should be removed. Briggs has taken away the cranial wall covering an area as large as the palm of the hand, and cured the epilepsy without causing any unpleasant symptoms.

From tables of the operation collated by Stephen Smith, Billings and Echeverria,<sup>3</sup> 92 American operations are reported, of which 63 were cured, 13 ameliorated, 2 not changed, 14 died. Walsham<sup>4</sup> has collected 82 cases, to which he has added 48 collected by Billings and others, making 130 in all, of which number 75 were completely cured, 18 improved, 7 unimproved or worse, 30 died. Thirty cases of epilepsy from old injuries of the head have been operated upon by Briggs; of these 25 were cured, 3 ameliorated, 1 not changed, and 1 died.

In 48 of the 82 cases collected by Walsham<sup>5</sup> himself, cure was effected; 13 were relieved at the time of the report, 4 were not improved and 17 died, which gives a death rate of 20.7+ per cent.; but some of the deaths occurred so long after the operation as to be scarcely attributed with justice to the operation.

Nancrede<sup>6</sup> says that after adding 37 cases collected by himself to the whole number collected by Walsham (130), he finds in the 167 cases a mortality of 19.16 per cent., but does not describe the kind of cases in which death occurred.

Cure has in a number of cases followed operation, though

<sup>1</sup> Briggs, *Transactions American Surgical Association*, 1884.

<sup>2</sup> *Amer. Jour. Med. Sciences*, January, 1880, p. 270.

<sup>3</sup> Quoted from Briggs.

<sup>4</sup> *St. Bartholomew's Hospital Reports* (1883), p. 130.

<sup>5</sup> *St. Bartholomew's Hospital Reports* (1883), pp. 130 and 136.

<sup>6</sup> *International Encyclopedia of Surgery*, Vol. V., p. 101.

no pathological change was recognized in bone or membranes.

In epilepsy and insanity from traumatic causes connected with the skull, the lesions appear, according to Walsham,<sup>1</sup> to have generally existed in the anterior half segment of the cranium. The symptoms justifying operation are cicatrices which are sensitive, tender, and abnormally hot by the surface thermometer; pain or sense of brain pressure at the seat of old injury, which may not be constant, but which is always, when present, referred to the same spot; pain, vertigo, or convulsions produced by pressure upon the cicatrix; depressions or elevations in the bone; fistulas leading to necrotic bone, and any symptoms indicating, through study of cerebral localization, brain lesion in the region of the external scar. Operation seems to me to be especially indicated in these cases if the scar is in front of the middle of the cranium.

The symptoms contra-indicating operation on the head are the existence of other foci of irritation, as in one of Briggs' patients, who had a depression of the skull and diseased bone in one leg, and in whom the removal of the necrotic tissue in the leg cured the epilepsy without any surgical interference with the head. The absence of pain, tenderness, or other symptoms of irritation, the history of epilepsy in other members of the family, or a short period of medicinal treatment, would be facts that should cause hesitation in operation until every other means has been employed, or until the progressive character or the severity of the epilepsy forebodes early impairment of intellectual functions.

If operation fails to relieve, it may be repeated near the old spot of operation after the lapse of several months; for at least one case is known where operation was ineffectual, and subsequent autopsy showed a fragment of bone pressing upon the encephalon. Removal of this would probably have cured the epilepsy. Several months time must elapse before the operation is declared unsuccessful; for the brain does not always give up its convulsive habit at once. Subsequent treatment to relieve the hyper-excitability of the medulla and

<sup>1</sup> On Trephining the Skull in Traumatic Epilepsy, *St. Bartholomew's Hospital Reports* (1883), p. 139.

pons, and to remove any other causes of peripheral irritation, must be judiciously carried out. The cicatrix left after trephining may become a secondary peripheral irritant, and need excision to relieve pinched nerve filaments. I know, however, of no such case on record.

How long should operation be delayed in epilepsy presumably caused by a depressed fracture of the skull or other localized traumatic irritant? Certainly not at all after the diagnosis of the cause has been made, provided that medical means have been efficiently tried and have failed. Operations done promptly prevent an increased development of abnormal excitability in the convulsive centres, and give, therefore, the best chance of recovery from the epileptic manifestations. Mental deterioration increases with the lapse of time, as does in my opinion the risk of serious cerebral reaction after operation. A normal nervous system would be less likely to assume inflammatory symptoms dangerous to life than would a nervous tissue long subjected to irritating influences.

If the epilepsy cannot be definitely attributed to the traumatism, which by the history and by the scar is known to have occurred, I should advocate an empirical operation in the course of five or six months, or even earlier; provided that no other cause is discovered, that medicinal treatment has proved unavailing, and that the epilepsy is increasing in severity.

*E.* Operations for the relief of insanity due to cranial traumatism have not been very generally advocated or attempted. One year ago Dr. William A. Byrd<sup>1</sup> brought the subject to the attention of this Association, and referred to four cases which were trephined for insanity after fractured skull. Three were operated upon by Dr. W. T. Briggs, the fourth by Dr. Byrd himself. Dr. Byrd's case improved for a short time, and then became progressively worse in regard to her mental condition. Two of Dr. Briggs' cases entirely recovered their mental health; one was a boy, the other a man who had received a gunshot fracture above the ear. The third of Briggs' cases was an almost hopeless one, which he had at one time declined to subject to operation. The lamentable condition of the im-

<sup>1</sup> *Transactions American Surgical Association* (1884), p. 130.

becile patient and the solicitations of the family finally induced him to operate. Death occurred on the second day after, "a rigor followed by great depression."

In the discussion following Dr. Byrd's paper, I find Dr. T. F. Prewitt<sup>1</sup> is reported as having spoken of trephining an insane woman, who was relieved only for a time. The report here is incorrect, for Dr. Prewitt has written me that he has never trephined for insanity. The remarks, I think, should be ascribed to Dr. Byrd, and refer to his case, which formed the subject of debate.

I find a case of insanity cured apparently by operation, mentioned by Dr. L. A. Stimson, and another by Dr. J. L. Little.<sup>2</sup>

In his elaborate table of trephining cases, Amidon<sup>3</sup> refers to McCormick's case of acute mania, occurring eight years after a depressed cranial fracture, which recovered after the depressed area of bone was removed by operation. In this instance there was pain at the site of wound, which was situated at the junction of the sagittal and coronal sutures.

With so few cases as are reported, it is difficult to formulate dogmatic rules. It seems to me, however, that the operation of removing a portion of the cranium is justifiable when, within a few months after a depressed fracture of the skull, progressive mental aberration occurs in a previously sane patient who presents no other assignable cause for the intellectual malady. If there is pain or tenderness at the site of the injury, or if motor or sensory phenomena are found in the regions supplied by the nervous centres situated under the seat of the injury, the demand for operation is much more imperative. I admit that cases reported as cured of acute maniacal symptoms by trephining are doubtful cures, because they might have recovered without operation. A number of chronic cases recovering after operation would afford much more conclusive evidence of the value of operative therapeutics.

Operation should be done before the pathological changes cause great imbecility. If pressure causes local degeneration

<sup>1</sup> *Transactions American Surgical Association*, p. 134.

<sup>2</sup> *Annals Anatomy and Surgery*, VIII. (1883), p. 137.

<sup>3</sup> *Annals of Surgery*, March, 1885, p. 211, quoted from *American Practitioner* XXVII. (1883), p. 237.

or atrophy of the cerebral convolutions, it is imperative to remove that pressure as soon as it is evident that remedial drugs afford no relief, and that the mental impairment is progressive. In an early part of this paper I have referred to a case seen by Dr. Mills and myself, in which I was prepared to trephine as soon as it was clearly established that the mental deterioration had no other assignable cause than the depressed fracture. Unfortunately the patient passed from observation.

It is impossible to fix any time ; but progressive failure during three months would incline one to operate, and the same conditions during six months would, I think, justify the surgeon to very strongly urge surgical treatment. On this point, however, I should like to hear the views of the Fellows of the Association.

In operating, all the depressed bone should be removed, by cutting away the intervening bone between the holes made by numerous applications of the trephine. Hey's saw, the gnawing forceps, or the burr attached to the surgical engine will accomplish this. Guthrie<sup>1</sup> refers to a case of fracture, but not of insanity, in which twelve disks were removed before the depressed bone was properly elevated. Recovery followed.

Operation is not justifiable when there is evidence that some degree of insanity existed before the injury, nor when the patient has had, previously to the injury, insane delusions, not traumatic, from which he had recovered before the traumatism ; nor when the character of the insanity is such that the pathological change is probably located in a region of the brain distant from the seat of injury ; nor when the insanity involves so many intellectual functions that general cerebral disease is clearly existent.

*F.* Operations for the removal of cerebral tumors have, as far as I know, been attempted only recently. The fear of approaching the brain with instruments deterred surgeons in a manner that seems unaccountable, when we recall the numerous instances of recovery from accidental brain injuries that have been reported during the past fifty years. It is probable that the most of those which recovered were of a character

<sup>1</sup> Gross, *System of Surgery*, Vol. II., p. 88.

that insured efficient drainage, and that we did not have discernment enough to realize the true method by which fatal results were averted.

Primary cerebral tumors which are not controlled by medical treatment are usually single, seldom give rise to secondary deposits, are generally surrounded by an inflammatory zone of demarkation, and continue to increase in size until they destroy life. Therefore, when they are believed to be upon or in the cortex of the brain, or at least not deeply located in the cerebral substance, they should be removed by operation, unless they are in some such inaccessible and especially dangerous region as that at the base of the brain. Amidon<sup>1</sup> was one of the first, if not the first, to insist upon this method of dealing with cerebral tumors. A few months ago Godlee removed by enucleation a glioma the size of a walnut, situated a quarter of an inch below the surface of the ascending frontal convolution, which had been located by Bennett.<sup>2</sup> For 20 days the patient did well, but he died on the 28th day from meningitis at the lower part of wound spreading down towards the base of the brain on same side, the whole of which was inflamed and covered with plastic lymph. The rest of the brain was normal.<sup>3</sup>

Amidon justly asks whether death might not have been due to the absence of antiseptic precautions and the want of provision for drainage; especially as the galvano-cautery was used to stop bleeding. I am not aware that the operator has definitely stated whether antiseptics were adopted and provision for drainage made.

This remarkable case of sagacious diagnosis by cerebral localization followed by a well planned surgical operation is certainly very encouraging, and will doubtless be the incentive which will save many lives.

Multiple cerebral tumors, tumors of the base, cerebral growths secondary to neoplasms in other localities should not be subjected to operation. If other circumstances obtain, and the symptoms are such as will localize the growth with reasonable certainty excision should be attempted.

<sup>1</sup> *Medical News*, June 21, 1884.

<sup>2</sup> *Lancet*, December 20, 1884, and January 3, 1885.

<sup>3</sup> See Amidon's discussion of its details in *Annals of Surgery*, March, 1885.



Sands<sup>1</sup> records a remarkable case, in which Dr. R. W. Amidon diagnosed traumatic epilepsy in a patient who had struck the left parietal region against a sharp corner, but in which trephining showed no bony lesion. Death occurred in eight days, and a gummy tumor, which could probably have been removed, was found directly beneath the seat of trephining. No evidence of meningitis from the operation was apparent. This case may have been a potent factor in determining Dr. Amidon's well known advocacy of the enucleation of cerebral tumors.

Dr. Charles K. Mills, who has made at least 25 or 30 autopsies in cases of brain tumors, and of which number twelve have been published,<sup>2</sup> has called my attention to the fact that in several of them removal of the tumor would have been readily possible.

I give from his paper an abstract of two cases :

CASE 4. Clinical History: Female, æt. 30. No history of causation. Headache, continuous, sometimes agonizing. Percussion of head caused most pain in right parietal region. Vomiting when headache was most severe. Vertigo. Mind clear, but acted slowly; emotional. Spasm, beginning with twitching of fingers of left hand; most severe on left side, and especially in left arm. Upper as well as lower fibres of left facial nerve partially paralyzed; nearly complete paralysis of left arm; slight paralysis of left leg. Bowels and bladder partially paralyzed. Impaired sensibility in limbs of left side. Left patellar reflex diminished. Sight very imperfect. Choked disks. Hearing defective in right ear.

*Pathological Anatomy.* Carcinoma. About  $1\frac{1}{2}$  inches in diameter beneath and adherent to the pia mater of the convexity of the right hemisphere; the pia and dura mater were united by strong adhesions. The tumor involved the middle portion of the ascending parietal convolution and the upper part of the inferior parietal lobule, pushing aside the inter-parietal fissure. The anterior extremity of the tumor was about one-fifth of an inch back of the centre of the fissure of Rolando. On the inner side of the tumor the white matter of the brain was broken down.

CASE 5. Clinical History: Female, æt. 38. History of syphilis. Blows on the head. Headache, with agonizing paroxysms. Top and right side of head sensitive to percussion, and headache severest in these regions. Vomiting. Vertigo. Great mental irritability. Severe left-sided spasm, beginning with twitchings in left toes and foot. Partial paralysis of right leg and arm, most marked in leg. Hyperæsthesia. Impaired sight. Choked disks. Head temperature taken once—right parietal region, 97.2° F.; left parietal region, 96° F.

*Pathological Anatomy.* Gumma. Attached to the frontal membranes of the right convexity. Involved the upper fourth of the ascending frontal, and a smaller segment of the ascending parietal convolution, crossing the fissure of Rolando at its upper extremity. A good example of strictly cortical lesion, involving only gray matter, and having only a very thin layer of softened tissue on its inner side. Micro-

<sup>1</sup> *Annals of Anatomy and Surgery*, Vol. VIII. (1883), p. 113.

<sup>2</sup> *Archives of Medicine*, August, 1882.

scopical examination of the optic nerves showed the appearances of choked disks, with probable ascending neuritis.

I have thus considered most of the topics which may be included under the head of cerebral surgery. In fractures, hemorrhage, and abscess perforation of the skull will soon become quite common. In epilepsy, insanity, and tumor the profession will be more tardy in opening the skull. While I am sure that these conditions, in certain instances, can only be treated successfully by operative procedure, I believe, also, that other cerebral conditions, less well defined in pathology, such, for example, as incurable and intolerable headaches after injury, may in time be justifiably subjected to similar operations.

For such operations upon the skull and brain, proper instruments should be at hand. For uncovering the centres of motion, in searching for suspected lesions localized by symptoms, a trephine removing a disk 3 centimetres in diameter is none too large, for then both ascending convolutions and the intervening fissure of Rolando can be inspected with ease. A trephine with a cutting edge along only a half or two-thirds its circumference would, I think, be convenient at times for deepening a groove on one side of the disk, when the remaining portion of the circular groove has already cut through the bone in a thinner spot; and also for enlarging a trephine hole previously made. Dr. W. B. Hopkins has suggested a modification of the trephine which may be of value in this connection.<sup>1</sup> A probe with a large olive shape head and a light aluminium shaft, as recommended by Fluhrer, is certainly the proper exploring instrument in gunshot wounds of the brain. The head should, as he suggests, be placed so that the probe will be vertical and drop into the wound by its own weight. Aspirating needles should probably be made with a round end, and a lateral opening like a catheter.

Appended will be found tabulated statements of I. *The indications for operation in traumatic cases*; II. *Contra-indications*; III. *Points for opening the cranium when operation is indicated*; and, IV. *Uncertain localizations*. In the order of the argument, these belong at the end of that portion of the memoir which appeared in the last issue.

<sup>1</sup> *Annals of Surgery*. July, 1885.

TABLE I.—INDICATIONS IN TRAUMATIC CASES.<sup>1</sup>

1. Hemispasm or	{	On the opposite side of the body after even slight injury in the fronto-parietal region, and even when not directly over the motor area,	{	Indicates exploratory operation at the seat of the injury.
2. Incomplete hemiplegia or				
3. Hemispasm with hemiplegia,				
4. Monospasm or	{	Ditto, ditto,	{	Indicates, indeed demands, exploratory operation at the site of the injury.
5. Monoplegia, whether total or incomplete,				
6. Hemi-hyperaesthesia or	{	On the opposite side of the body after even slight injury in the parieto-occipital region near or somewhat behind the motor area,	{	May indicate exploratory operation at the side of injury.
7. Hemi-anesthesia or				
8. Hemi-analgesia or				
9. Hemi-hyperaesthesia with anaesthesia or hemi-analgesia,				
10. Mono-hyperaesthesia or	{	Ditto, ditto,	{	May indicate, or may perhaps demand, exploratory operation at the site of the injury.
11. Mon-aesthesia or				
12. Monalgnesia,				
The twelve symptoms above mentioned, if on the same side as the injury, contraindicate operation at the site of the injury, but				
13. Coma with hemispasm or hemiplegia,	{	In cases of supposed subcranial or arachnoid hemorrhage,	{	May indicate exploratory operation on the side opposite the paralysis or spasm.
14. Coma with hemi-hyperaesthesia or hemi-anesthesia or hemi-analgesia,				
May indicate exploratory operation on the side opposite the hyperaesthesia, anaesthesia or analgesia.				

<sup>1</sup> See Notes on Dura Mater and its Lesions.

TABLE II.—CONTRA-INDICATIONS.

1. Paralysis of one or more cranial nerves, Neuro-iritis, Cheyne-Stokes respiration, or Other symptoms showing lesions probably at the inaccessible base of the brain, or in undeterminable parts of its interior,	Even if other symptoms indicate operation, are, except in cases of supposed cerebral abscess,	Contra-indications to exploratory operation,
2. Complete hemiplegia; which often is not of cortical origin, but is due to lesions of deep structures,	Is, except when 1. It is due to a supposed cerebral abscess; 2. It has been incomplete at outset; 3. It is irregular and corresponds with extensive depression of bone on opposite side of cranium,	A contra-indication to exploratory operation.
3. Hemispasm or hemiplegia with marked hyperaesthesia or anaesthesia indicates more extensive cortical lesion than hemispasm or hemiplegia alone, and may even be due to deep lesions,	Is, except when 1. The hyperaesthesia or anaesthesia is limited to a small surface (monaesthesia); 2. Hyperaesthesia or aesthesia is apparently due to the same cortical lesion that causes the spasm or paralysis,	A contra-indication to exploratory operation.
4. Hemispasm or Hemiplegia on same side as injury,	May, if other symptoms indicate operation, be an indication for operation on the side of the cranium opposite that of the injury, but	Is a contra-indication to exploratory operation on the injured side of the cranium.
5. Complete anaesthesia (?),	* * * * *	* * * * *
6. Hemihyperaesthesia or Hemianalgesia, with marked spasm or paralysis, indicates more extensive cortical lesions than hemihyperaesthesia or hemianaesthesia alone and may even be due to deep lesions,	Is, except when 1. The spasm or paralysis is limited to a small group of muscles (monoplegia); 2. The spasm or paralysis is apparently due to the same cortical lesion that causes the hyperaesthesia or anaesthesia,	A contra-indication to exploratory operation.
7. Hemihyperaesthesia, or hemianaesthesia or hemianalgesia, on same side as injury,	May, if the other symptoms indicate operation, be an indication for operation on the side of the cranium opposite to that of the injury, but	Is a contra-indication to exploratory operation on the injured side of the cranium.

NOTE.—When the symptoms indicate that many centres are involved—and this is usually the case—more bone must be removed than by a single large trephine perforation. The burr of the surgical engine or the gnawing bone forceps are the most convenient instruments for enlarging the trephine hole.

TABLE III.—POINTS FOR OPENING THE CRANIUM WHEN OPERATION IS INDICATED.

<i>Symptoms.</i>	<i>Probable Area of Cortex Involved.</i>	<i>Points where Brain should be Uncovered.</i>	<i>Remarks.</i>
Hemispasm or Hemiplegia.	Along entire length of fissure of Rolando or possibly along a portion of its extent, and involving other areas secondarily. More probably in front rather than behind fissure.	Over middle fissure of Rolando, and to be extended downwards, upwards, and forwards in search for lesions, rather than backwards, unless disturbances of sensation have been present; then backward extension is indicated. If aphasia is present, the opening should be extended downwards and forwards.	
Cranial Monospasm or Monoplegia (convulsions or paralysis limited to one leg or part of one leg).	Upper third of central region in ascending convolutions, and astride of upper end of fissure of Rolando. Possibly in front rather than behind fissure (?). Some say, in ascending parietal convolution rather than in frontal. (See Erichsen, vol. i, p. 725, and Lucas-Championnière.)	Over upper end of fissure of Rolando, and to be extended forwards rather than backwards, unless disturbance of sensation is present.	
Spasm or paralysis of both legs, not due to spinal lesion.	Upper part of central region and paracentral lobules on both sides.)	Over middle line between upper ends of both fissures of Rolando; to be extended towards the side of the vault of cranium which is opposite to the side of the more pronounced symptoms. Take care to avoid, if possible, injury to superior longitudinal sinus.	
Brachial monospasm or Monoplegia (convulsions or paralysis limited to one arm or part of one arm).	Middle third of central region in ascending convolutions, especially in ascending frontal.	Over middle third of fissure of Rolando; but rather more in front than directly over the fissure, though the fissure should be uncovered. To be extended forwards rather than backwards, unless disturbance of sensation is present.	Facial spasm or paralysis is often associated with the cranial symptoms, as by hemorrhage gravitating downwards, etc.
Associated cranial and brachial monospasm or monoplegia.	Upper two-thirds or at junction of upper and middle thirds of central region, probably in ascending frontal rather than in ascending parietal convolution.	Over junction of upper and middle thirds of fissure of Rolando.	

TABLE III. — POINTS FOR OPENING THE CRANIUM WHEN OPERATION IS INDICATED. (*Continued*)

<i>Symptoms.</i>	<i>Probable Area of Cortex Involved.</i>	<i>Points where Brain should be Uncovered.</i>	<i>Remarks.</i>
Facial spasm or paralysis.	Lower third of central region, especially in ascending frontal and posterior end of second frontal convolutions. The anterior part of this area seems to control chiefly the motions of the upper part of the face; and the posterior part the motions of the lips and mouth.	In front of lower third of fissure of Rolando, though the posterior edge of opening should be close to the line of the fissure of Rolando.	Aphasia is often associated with the facial symptoms.
Aphasia.	Below and in front of lower end of fissure of Rolando, varying somewhat with form of aphasia: 1. Sensory aphasia in first temporal sphenoidal convolution. 2. Motor aphasia in posterior part of third frontal and lower part of ascending frontal convolution. 3. Aphasia of incoordination in vicinity of island of Reil. Aphasia in right-handed persons is due to lesions on left side of brain; in left-handed persons, to lesion on right side of brain.	About 1.25 centimetres below and 1.25 centimetres in front of the lower end of the fissure of Rolando.	Single large opening will cover the convolutions for the three forms of aphasia, but the area for the third form is deeply situated in the fissure of Sylvius.
Associated brachial and facial spasm or paralysis.	Convulsions involved are those of arm and face, as given above.	In front of junction of middle and lower thirds of fissure of Rolando.	
Associated brachial and facial spasm or paralysis with aphasia.	Convulsions involved are those of arm, face, and speech, as given above.	In front of lower third of fissure of Rolando; and to be extended upwards, or downwards and forwards, according as brachial and aphasic symptoms are more pronounced.	
Associated facial spasm or paralysis and aphasia.	Convulsions involved are those of face and speech, as given above.	About 1.25 centimetres directly in front of the lower end of the fissure of Rolando; and to be extended upwards and backwards, or downwards and forwards, according as facial or aphasic symptoms are more pronounced.	

TABLE IV.—MORE UNCERTAIN LOCALIZATIONS.

Hemihyperæsthesia, Hemi-anæsthesia, Hemi-analgesia.	Behind fissure of Rolando in ascending parietal, and first and second parietal convolutions.	Behind the middle fissure of Rolando, and to be extended backwards rather than forwards.
Crural mono-hyperæsthesia, Crural mono-anæsthesia, Crural mono-analgesia.	Upper third of ascending parietal convolution and portion of parietal convolutions just behind.	Behind upper third of fissure of Rolando.
Hyperæsthesia of both legs, Anæsthesia of both legs, Analgesia of both legs, (Not due to spinal lesion).	Same region as in case above, but on both sides of the brain.	Over middle line behind the upper ends of both fissures of Rolando, to be extended towards the side of the vault of cranium opposite to the more pronounced symptoms. Take care to avoid, if possible, injury to superior longitudinal sinus.
Brachial mono-hyperæsthesia, Brachial mono-anæsthesia, Brachial mono-analgesia.	In middle third of ascending parietal convolution and portion of parietal convolutions just behind.	Behind middle third of fissure of Rolando.
Associated crural and brachial mono-hyperæsthesia, Associated crural and brachial mono-anæsthesia, Associated crural and brachial mono-analgesia.	Upper two-thirds of ascending parietal convolution and portion of parietal convolutions just behind.	Behind middle two-thirds of fissure of Rolando.
Facial hyperæsthesia, Facial anæsthesia, Facial analgesia.	Lower third of ascending parietal convolution and portion of parietal convolutions just behind.	Behind lower third of fissure of Rolando.
Associated brachial and facial mono-hyperæsthesia, Associated brachial and facial mono-anæsthesia, Associated brachial and facial mono-analgesia.	Lower two-thirds of ascending parietal convolution and portion of parietal convolution just behind.	Behind lower two-thirds of fissure of Rolando.

TABLE IV. — MORE UNCERTAIN LOCALIZATIONS. (*Continued.*)

Loss or change in powers of attention, reason, judgment, or self-control.	Frontal lobes.	Surface of frontal bone, but the spot could only be located by some other symptom which might be present, such as aphasia or ocular deviation, affections of the leg or arm.
Muscular deviations of the eye and dilatation of the pupil.	In first and part of the second frontal convolutions in front of the motor centre for arm, reaching nearly to the longitudinal fissure.	About three centimetres in front of spot for exposing motor centre of arm.
Blindness, or failure to recognize and remember familiar objects, or hallucinations of vision.	Occipital lobes near parietal lobes, not far from angular convolution. Blindness of half field of both eyes at <i>right</i> side of body indicates destruction of <i>left</i> lobe, and vice versa.	About seven centimetres above the external occipital protuberance and seven centimetres around the skull laterally.
Deafness, or hallucinations of hearing.	First temporo-sphenoidal convolution of side opposite to affected ear. Failure to recognize or remember <i>spoken</i> language is a form of aphasia (sensory aphasia), and is due to lesion in first temporo-sphenoidal convolution.	Just below and about three centimetres behind the lower end of the fissure of Rolando.
Loss or hallucinations of smell.	Probably at base of brain in temporo-sphenoidal region.	Not accessible to operation.
Loss or hallucination of taste.	Not located.	



## A CASE OF CATHETER FEVER.

By JOHN HADDON, M.D.,

OF EDINBURGH.

THE patient, A. H., aged 66 years, had enjoyed excellent health, as a farmer in the country, until about eight years before the beginning of his illness, when he began to be troubled with symptoms arising from enlargement of the prostate gland, such as frequent micturition, especially after having taken any stimulants, requiring a long time to micturate, delay being noticed both at the beginning and end of the act.

In the morning having made water on getting out of bed, he often had to pass more before he had finished dressing. He also at times was quite oppressed with drowsiness, and a sense of weight of the head, with occasional giddiness.

Hæmorrhoids also troubled him, which at times bled freely.

In the winter of 1881 one of his feet became painful, and he thought he had sprained the ankle, but it had not the character of a sprain. The pain was over the lower part of the joint, about the middle of the inner side, where there was slight fulness. After lasting some months, the pain ceased; but in 1882 the other foot was similarly affected, which also got well, after a duration of some months. In the end of 1883, the left knee joint became painful, a tender spot existing over the internal semilunar cartilage. This pain continued until he was taken ill on January 10th, 1884, suffering from inflamed hæmorrhoids, and great difficulty in passing urine. He could pass only a very small quantity at once, but in the night the urine had passed without his knowledge.

On January 11th, he continued in the same state going about the house, and feeling much out of sorts.

On January 12th, he went to bed at 8 p. m. feeling cold.

On January 13th, a soft elastic catheter was passed quite easily, and twenty ounces of healthy looking urine escaped.

On January 14th, the catheter could not be passed.

On the 15th, he passed urine fairly well, and still continued in bed.

In the night between the 16th and 17th, he passed a potful of urine.

On the 18th he was not so well, having had a restless night, passing urine every quarter of an hour.

On the 19th he continued in the same state. The hæmorrhoids were very painful, and at 10 p. m. he had half a grain of morphia in a suppository. At 1 a. m. he had another suppository. He continued passing urine about every quarter of an hour until 6 a. m. of January 20th, when he could not pass any, and on getting into bed, at once fell asleep.

He continued asleep, breathing somewhat heavily, though not unnaturally until 11 a. m., when Professor Chiene saw him for the first time.

On trying to awake him, it was found that he was in a comatose state. His pupils were small, his skin moist, his pulse fast for the first time, and quite soft. Having tried to pass soft catheters without success, the silver prostatic one was passed, without difficulty. About thirty ounces of acid urine escaped, followed by a white stream of pus.

It required a good deal of rousing to get him to look up at all, and he recognized no one.

At 1 p. m. the pulse was very weak and fast, though his breathing was good. At 5 p. m. a rattle was heard in the throat, the pulse continuing very weak and irregular.

At 9 p. m. the catheter was again passed, and the bladder washed out with a solution of corrosive sublimate (1 in 2000) according to the advice of Professor Chiene, under whose direction the case was now treated.

During the operation he merely moaned as if he felt something unusual. At 10:20 p. m. the breathing became very weak, the pulse very feeble, and death seemed imminent. About 11 p. m., however, he began to look about, as if recognizing those around him, and gradually intelligence returned. The perspiration ceased, the skin become dry, and the tongue was dry and furred. The pupils were still contracted.

On January 21st at 9 a. m., twenty-five ounces of red urine were withdrawn; but the bladder could not be washed out on account of clots of blood obstructing the instrument.

On January 22d, he began to hiccup, the pulse was weak, irregular and intermittent. At 7 a. m. eighteen ounces of red urine were withdrawn, and as the clots were found to obstruct the passage of urine, they were sucked through the catheter until the bladder could be emptied, and washed out as before. The pulse continued very irregular, and intermittent but he had two hours of sleep in the afternoon. There was dullness at the base of the right lung, and he had some cough, spitting up almost pure blood. At the upper part of the sacrum on the

right of the middle line, there was an indurated swelling about an inch broad, by an inch and a half long, which did not give him any pain, but care was taken to avoid pressure upon it.

On January 23d, there was some difficulty in passing the silver catheter and a French double curved soft one, passed easily. He now had great pain when the bladder was empty, the pain being referred to the course of the urethra. This pain continued to trouble him at each operation of emptying and washing of the bladder. The pupils were beginning to dilate, his tongue was not so dry, and he was resting better. The sublimate solution was alternated in washing the bladder, with a weak carbolic solution, or permanganate of potash.

On January 25th, the urine was not so red and for the first time he passed a few drops himself.

January 26th. He felt cold in the night and complained of pain about the left elbow. The tongue was dry, with a sharply defined brown coat down the centre.

January 27th. The urine was of normal colour. He expressed himself as feeling well, but for the pain above the elbow joint, where fluctuation was felt and an opening having been made, a small quantity of pus escaped. The cavity of the abscess was syringed with sublimate lotion and dressed with cotton wool.

So the case continued. The bladder was emptied, and washed repeatedly during the day. The power of passing urine improved, but there was generally more or less pain even then. The pain along the urethra after emptying and washing the bladder was the greatest trouble. He never felt quite comfortable after the operation until he was able to pass a few drops of urine himself. Leaving some of the solution (much reduced) in the bladder seemed to lessen the after pain. Without continuing to give a detailed account of the case, it may be stated that the abscess above the elbow was healed by the 15th of February.

The swelling over the sacrum which had a crust over its most prominent part began to discharge a small quantity of pus on February 25th. On the 27th the hardness around it increased, and on passing a probe it went in several inches. On the 29th the orifice was enlarged to allow of free drainage and washing. On March 4th, the opening was found to be blocked up by a sloughing mass hanging in it, and the opening was enlarged still more by a bistoury. The probe went in four inches extending towards the crest of the ilium and the head of the femur. The tissues inside seemed one mass of slough, the skin being quite healthy. On March 6th the wound looked unhealthy with everted edges, and the discharge had almost ceased. At 5 p. m. he had a severe rigor lasting an hour. That night there was less pus in the

urine, the back was dry, and the atmosphere of the room was offensive with such a smell as one would have expected the wound in the back to have given out: but the wound had no unpleasant smell. Evidently the odour was exhaled with the breath. Next day on March 7th there was no such smell. He continued in a very critical state till March 20th, after which he gradually, though slowly, improved. The discharge from the back continued, sloughing tissue hanging from the wound and requiring now and again to be cut away. It was quite healed on April 13th and he was up and dressed for the first time on April 23rd. When taken ill he weighed about 15 stones. On April 29 he weighed 10 stones 3 lbs. On May 20th, 11 stones 3 lb.: and on June 21st, 12 stones 3 lbs. at which he remained.

The urine which contained pus when drawn off by Professor Chiene on January 20th, did not again show pus until February 1st and then it continued in it all through the illness. When at stool there was invariably a little thin pus passed with pain, as if the feces pressing on the enlarged prostate gland squeezed it into the urethra. When first examined by the microscope on February 12th, the urine contained innumerable highly refracting points (micrococci), but no bacteria were seen at that time. Bacteria however were soon discovered in newly passed urine, and continued all through even when he was up and going about. They varied in quantity, being most numerous when he was most feverish. There were also different kinds seen, such as simple moving rods, necklace-like combinations, straight and twisted in various ways; cells about the size of pus cells were also seen containing round particles, all in motion and giving the cell the appearance of a dissolving view, where all the colours of the rainbow could be seen. The bacteria were put into the various solutions used to wash the bladder but they did not affect their vitality. They were also put into solutions of greater strength and still their activity was unimpaired.

Some points of interest in this case may be noticed.

First of all there is the length of time during which he suffered from difficulty of emptying the bladder, with drowsiness and latterly pains in the joints of the feet and knees.

So far as one can judge these symptoms were due primarily to the obstruction offered to the exit of urine from the bladder from the enlarged prostate, and secondarily, to the accumulation of urine in the bladder which probably had some prejudicial effect on the action of the kidneys.

If the catheter had been used when these prostatic symptoms

first appeared, it is probable that the health of the patient might have been improved and such an illness as he ultimately endured might have been prevented.

Then as to the illness itself:

It is evident that without the catheter, death would have been certain and so the catheter must be used even though it is supposed that the catheter is the cause of the fever. That, however, I believe will be found to be a mistaken notion. I have seen an old man whose urine used to dribble from him, so that his trousers seldom were dry, suddenly seized with what was something like apoplexy, and die after lingering a few days in a state of coma. That coma I have no doubt was identical with that seen in the case I have mentioned, and in it no catheter was passed.

I have also seen a man advanced in life but engaged in business, who for years had been obliged to pass urine every hour, night and day, suddenly taken ill with feverish symptoms and drowsiness which gradually merged into coma and death. A surgeon saw him when in a semi-comatose state. Having heard his history, and seen his symptoms, he thought it necessary to pass a catheter, no catheter having previously been passed. A soft catheter was passed and a small quantity of urine withdrawn but without any improvement in the patient, who never regained consciousness. In that case the fever could not be dependent on the use of the catheter. The character of the coma so far as I have seen in cases of catheter fever is unlike that of apoplexy, or uræmia. There is neither the bounding pulse or the stertorous breathing of apoplexy, nor the peculiar smell, which is associated with uræmia. Whatever be its cause, whether it be the urine by its pressure preventing the action of the kidney, or the absorption of stagnant urine through the kidney, bladder, or diseased prostate, it was removed after emptying the bladder and washing it out with a solution of corrosive sublimate in the case narrated.

Following the coma we had mischief in the tissues over the right side of the sacrum and above the left elbow, while blood was effused into the right lung and into the bladder. Wherever the blood came from which formed as it were a cast of the bladder, for the catheter could be felt as if passing into

a solid mass, it is pretty certain that it did not come from the kidney. Its most probable source would seem to be the prostate itself.

The mischief above the elbow formed an abscess. The swelling over the sacrum which was almost painless, and which seemed to increase and diminish in size as the temperature rose and fell remained as it were in a latent state for over a month. Then it began to discharge, and a great mass of sloughing tissue was found, the skin over it being quite healthy. In seven weeks it healed, leaving scarcely a trace of its existence.

I have seen the same kind of a sore in the same place, in those suffering from catheter fever, who never were comatose, and though I cannot cite a sufficient number of cases from which to generalize, it seems probable that there is some close relation between such lesion of this particular part, and the bladder or prostate.

The enlargement of the opening which was made on March 4th, followed on March 6th by a severe rigor, the first symptom of septicæmia, suggested the relationship of cause and effect, so powerfully that Dr. McLeod, who attended the patient with me, expressed the opinion, that in such cases under such circumstances, the cautery would be a safer instrument than the knife with which to make an incision.

The state of the urine in cases of catheter fever, as Sir Andrew Clark pointed out, is of low specific gravity. In this case the specific gravity was not taken before the attack, but the urine was examined for albumen and found quite free from it. During the attack the specific gravity was as low as 1003. About April 10th, when he seemed improving, it reached 1015, and in July was 1019. The quantity of urine varied from 550 c. c. to 1950 c. c. *per diem*.

This state of the urine of low specific is well worthy of study.

In 1875 I made some observations on my own urine, during the whole month of December. I found the specific gravity of urine passed at particular times, for example after reading anything that required thought or which was exciting, such as a sensational novel, was as low as 1004, but the average for the month was 1024.

The quantity of urine varied from 680 c. c. to 1610 c. c., the average being 980.

The amount of urea varied from 13.5 grammes to 27 grammes, while the average was 18.5. I found that the amount of urine and the urea varied directly; while both of these varied inversely as the specific gravity.

Thus, if these observations are correct, the low specific gravity of the urine in catheter fever, is no indication of diminished excretion of urea and as there is no albuminuria, its cause is yet to be found.

As to the relation of bacteria to this disease: They were no doubt in the urine, but whether they were there from the beginning I cannot say. So far as I have been able to form an opinion, I am inclined to think that they are a consequence and not the cause of the state of the system.

The character of the suffering is well marked. The pain extends from the perinæum along the urethra and shows that it is about the prostatic portion of that canal where is the origin of all the trouble.

The true nature of the disease, so far as its local history can be made out, consists in inflammation and suppuration of the enlarged prostate gland. As felt, per rectum, the gland seemed as large as a child's head. Seeing, then, that the prostate is the sole cause of all the trouble, that it is a comparatively useless gland, especially at the age at which it generally causes trouble, why should it not be attacked directly by the surgeon, instead of merely emptying the bladder by the catheter and trying to get rid of its deleterious products, when they have escaped into the bladder, while the cause remains, and in the event of the patient's recovery continues to render life more or less irksome? That seems the direction in which our study of this very common ailment ought to extend, and he who can devise a safe operation for the relief of such sufferers will deserve well of his country and kind.

COMPOUND COMMINUTED FRACTURE OF PATELLA; WIRE SUTURES; NECROSIS OF UPPER FRAGMENT; FINAL RECOVERY WITH USEFUL LIMB.

By GEORGE R. FOWLER, M.D.,

OF BROOKLYN.

SURGEON TO ST. MARY'S GENERAL HOSPITAL.

MRS. R., aged 38, was brought in by the ambulance on the night of August 21, 1884, suffering from a compound comminuted fracture of the right patella. In a fit of temporary aberration of mind, she had leaped from the second story window of her residence to the sidewalk below, and it is presumed that in falling she struck her flexed knee against either the sidewalk or some projecting portion of an awning. The ambulance surgeon had applied some naphthalinated jute to the wound, and supported the limb with a back splint. Upon her arrival at the hospital, the house surgeon irrigated the parts with a 1.1000 solution of mercuric bichloride, and, while awaiting my coming, again covered the wound with naphthalinated jute.

I saw the patient several hours after the accident, and upon removing the dressings, found a transverse wound about an inch and a half in length across the anterior surface of the knee, communicating with the joint. The patella was broken into three fragments, the upper half of the bone representing one fragment, the lower half being broken into two unequal parts by a vertical line of fracture, the smaller one of the latter being located at the inner aspect of the limb. Having enlarged the wound sufficiently, it was found that the fibrous structure comprising the anterior coverings of the patella, as well as the aponeurotic expansion of the extensor muscles were completely torn across, and that, further, the irregular shreddy fibres of the upper edge of the rent were intimately adherent to the projecting spiculæ of the roughened fractured surface of the upper fragment. It was only after patient scraping and lifting away of this tissue, by means of the scalpel, that a clean bony surface was obtained for approximation to the lower fragments. I then drilled and wired together the two lower fragments;



these were in their turn each wired to the large upper fragment. The joint was thoroughly irrigated with a 1:1000 solution of mercuric bichloride, and a rubber drain,  $\frac{5}{8}$  of an inch in diameter, placed so that its inner extremity projected beyond the capsule at each angle of the incision. The rent in the latter was now closed by a continuous catgut suture, and the wound in the integument as well. Iodoform was dusted along the line of incision and wound, and cushions of naphthalinated wood-flour applied, secured in place with gauze bandages. A trough-shaped splint, made of coarse wire netting, well padded with cotton batting, was prepared, in which the limb was placed and bandaged.

At the end of fourteen days the dressings were removed, for the sole purpose of removing the rubber drains. No rise of temperature, pain, or other indication for disturbing the dressings occurred, and the use of non-absorbable drains alone necessitated the taking down of the limb at this time. The parts were aseptic, and the wound healed by first intention. The rubber drains were removed, strands of catgut substituted therefor, and the parts re-dressed. Immediately following this dressing, the patient developed an attack of dysentery, which, in addition to her already weakened intellect, made it exceedingly difficult to keep the discharges from the bowels from soiling the bed and dressings; however, this was fairly well accomplished, and for fourteen days longer the dressings were allowed to remain undisturbed, at the end of which time it was found that the openings from which the drainage tubes had been removed, at the previous dressing, had closed entirely, the projecting ends of the catgut strands, which had been substituted for the rubber tubes, coming away upon the cushion of wood-flour. It was discovered, at this time, that the line of union had parted directly over the most prominent portion of the patella for about  $\frac{3}{8}$  of an inch, and through the opening thus formed a necrosed condition of the upper fragment was found to exist.

On November 24, the upper fragment was found to be sufficiently detached to warrant an attempt at its removal. This was accomplished without much difficulty, after enlarging the opening, when it was found that the joint was perfectly closed by a thick fibrous capsule underlying the necrosed portion, connected to the upper margins of the now firmly united two lower fragments, and forming a strong ligamentous bond of union between the quadriceps extensor tendon above, and what remained of the patella below. The fragment removed was about the size of an English walnut. The cavity filled up rapidly, and the patient was discharged from the hospital, March 8, 1885, with a useful limb and considerable motion at the knee-joint.

At the time of writing (May, 1885), she goes about without perceptible limp, ascends and descends stairs in the usual way, and can flex her limb to a right angle.

REMARKS. I desire to call especial attention to the fact that this case was treated in an antiseptic manner from the very start. I think it was Esmarch who said that the fate of a wounded man depended in a great measure upon the practitioner who first touched him; and by this he meant that, other things being equal, the question of patient's life and quick restoration to health was often made to turn upon the fact of his wound being treated upon antiseptic principles, or not, in the very beginning. The ambulance is the proper place, above all others, for mercuric bichloride, carbolic acid and sterilized absorbent pads, and the sooner this fact is recognized and acted upon the better for our showing of good results, in compound fractures particularly.

In an able article upon this subject by Macewen, of Glasgow,<sup>1</sup> especial attention is directed to the entanglement of the soft parts between the fragments, and the very great probability of this complication being the principal cause of failure of union after transverse fracture of this bone. In the present case, a very good illustration of this state of affairs was found to exist, upon closely examining the parts.

The method of wiring claims attention for a moment. Stout platinum wire was used, silver wire of sufficient thickness not being at hand at the time. The two lower fragments were first wired together, and their upper margins were then sutured to the lower margin of the upper fragment by two wire sutures, one for each lower fragment. Thus the bone was placed in its normal relations as nearly as possible, and there maintained. Instead of hammering the ends of the wire down into the bone, as recommended by Lister,<sup>2</sup> I adopted a procedure, suggested by myself, for disposing of the ends of the wire, after bone-suturing. It consists of simply turning in the ends of the wire between the surfaces of bone.

<sup>1</sup> *London Lancet*. 1883. Vol. ii., page 847.

<sup>2</sup> "Antiseptic Excision of the Knee-Joint." *Proceedings Medical Society of the County of Kings*. 1880. Page 235.

The suturing of the torn edges of the capsule is a matter of some importance. In the earlier cases reported, no particular stress was laid upon this point. In an article upon this subject, Dr. F. C. Fuller, of New York,<sup>1</sup> advocates this step. I have endeavored to attain this in this class of cases, although it is no easy matter always to accomplish it. Upon the general principle of always attaching, when practicable, tissue to like tissue in the closing of wounds, this is a desirable point to care for, independently of the advantage gained by an early closure of the joint, and its consequent immunity from irritation from without, the latter always a source of danger.

It will be noticed that, in this case, drainage was accomplished by means of large sized rubber drainage tubes, and the latter were allowed to remain in position for a much longer period of time than that usually considered safe or desirable. Yet, no harm resulted; on the contrary, the perfect drainage obtained was of itself of the greatest safety. The sinuses left by the drainage tubes closed completely, in spite of the fact that they were occupied by strands of catgut, which were substituted for the rubber drains, at the time of the second dressing. I am inclined to think that too much stress has been laid upon the evil results supposed to arise from the presence of non-absorbable drains in the tissues, and not enough importance given to the necessity of using large drains in joint operations. In my experience, they certainly have seemed to be the safest, and, whether absorbable or non-absorbable, they should not be smaller in calibre than  $\frac{5}{8}$  of an inch in diameter, and should have thick, stout walls. It has been my practice for some time past, in cases where it is necessary to drain a joint, to use a large rubber tube at the first dressing, and to remove this, if all goes well, at the next subsequent dressing, and substitute for it a bundle of coarse catgut strands. As a rule, the dressing at which this is done suffices to complete the cure. It may be argued that, if catgut were used at the first dressing, the healing process might be accomplished under one dressing. I would reply that the risk of tension in the joint and its deplorable consequences are too great to be undertaken for the sake of escaping the slight inconveniences incident to an extra

<sup>1</sup> *Medical Record*. New York. Vol. xxiv., page 675.

dressing; for no capillary drain, however complete, can be as effectual as a closed trough or conduit, as exemplified by a firm walled drainage tube. Even when they have been left in for a period of fourteen days, as in the present instance, they have given rise to no irritation, and after their removal rapid closure of the sinuses has resulted. I am, therefore, constrained to offer a plea for large drainage tubes in joint cases, and the leaving of them undisturbed for longer periods of time than has heretofore been considered expedient.

The death and necessity for removal of the upper fragment was in no measure due to any failure of the antiseptic treatment, but was due, on the contrary, to the injury which the periosteum received at the time of the accident. König has met with a similar experience,<sup>1</sup> and Wahl is credited with another case, although the statement is first made that it was the lower fragment that perished. The occurrence of this sequel has led to the placing of the cases above quoted in the list of those having an unfortunate termination.<sup>2</sup> Surely, if the final result was such as occurred in the case herewith reported, it was an error to so place them. Death of one or more of the fragments, following the operation is probably an uncommon occurrence, although when it does occur, it need not necessarily invalidate the success of the operation.

The strength and completeness of the ligamentous connection between the upper margins of the lower fragments (which latter, by the way, had completely united, and by bone) and the quadriceps extensor tendon, was remarked at the time of the removal of the necrosed upper fragment. It reminded one forcibly of the ligamentous union found upon dissecting old cases of fracture of the patella.

<sup>1</sup> Statement made in Editorial, *Med. News*. Phila. Dec. 1, 1883. Page 603.

<sup>2</sup> Statement made in Editorial, *Med. News*. Phila. Dec. 8, 1883. Page 630.

## EDITORIAL ARTICLES.

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### ANEURISMAL TUMORS OF THE TEMPORAL REGION.<sup>1</sup>

Five varieties are described as affecting the temporal region. 1st. False primitive aneurisms, or bloody pulsatile swellings. 2d. Aneurisms of the superficial temporal artery. 3d. Aneurisms of the 'deep temporal. 4th. Perforating aneurisms of the middle meningeal. 5th. Arterio-venous aneurisms.

I. *Bloody Pulsatile Swellings.* Great as is the frequency of contusions and of bloody swellings of the cranium, pulsations in these tumors are just as rare; but P. Forestus and J. L. Petit have recorded cases in which serious errors of diagnosis have been made in such circumstances.

In contusions, the bones of the cranium, by reason of their convexity and the resistance which they oppose to the external force, play the part of a sharp instrument, cutting the tissues from the deeper to the more superficial structures. The arteries are sometimes divided, and give rise to bloody subcutaneous extravasations, veritable false primitive aneurisms, recognized in the early stages by pulsations. If these pulsations rarely exist in such tumors, this arises partly from the tenuity of the broken vessels, and partly from the difficulty of infiltration of the scalp—difficulties which result in the increase of the blood pressure at the spot, and the rapid obliteration of the vessels.

This is not so, however, in the temporal region, where larger arteries and a superficial fascia are met. The extravasation there is considerable, and the ruptured artery is less easily obliterated. Most frequently this obliteration takes place, and the pulsations slowly disappear—the tumor diminishes in volume, becomes solid, and is absorbed. At other times the obliteration of the vessels is provoked by the inflammation of the tumor. Sometimes the pulsations persist, and localizing them—

<sup>1</sup> *DeSanti, Archives Générales de Médecine.* 1884, Tom. II.; 1885, Tom. I.

selves upon one point, the extravasation disappears; but there remains upon the course of the artery a sacciform aneurism of traumatic origin. A good many temporal aneurisms have this origin.

II. *Aneurisms of the Superficial Temporal Artery.* It is difficult to pronounce upon the frequency of aneurisms of the temporal artery and its branches. If some authors, such as Scarpa, Lisfranc, and Desruelles, have observed several examples, the greater part of classical treatises content themselves with mentioning their existence only. This arises from the fact that no one has called attention to these aneurisms, and because of the favorable prognosis, surgeons who have observed them, have very rarely published their cases. In reality, these aneurisms are sufficiently common; and the author has collected 40 records.

These aneurisms, as are those of the small arteries generally, are ordinarily traumatic—always so, according to Heineke (*Deutsche Chirurgie*, Lief. 31. *Die Chirurgischen Krankheiten des Kopfes*, Stuttgart, 1882). They are most usually observed in men (18 times out of 27), and in young subjects (from 7 to 44 years). Their traumatic origin has caused them to be considered by the school of Scarpa as not being true aneurisms, and this may account for the little attention that has been given to them.

When the aneurism is the result of a wound, the tumor is ordinarily produced by the mechanism of the false consecutive aneurism—that is to say, after the cicatrization of the arterial wound. When, on the contrary, it follows a contusion, it forms habitually a false primitive aneurism. It presents a small indolent mass, circumscribed, regularly circular or elliptical, situated upon the course of the vessel, with visible pulsations, synchronous with the pulse, and presenting at times a small cicatrix at its most prominent point. The skin is healthy; sometimes adhering to the summit of the tumor; never œdematous or hypertrophied.

A special characteristic is that they were almost always placed at the bifurcation of the artery, or at a secondary bifurcation; and that it is very often necessary to tie the secondary branches, as well as the primary. These tumors remain stationary for a long time, and may be cured spontaneously, or by pressure.

Many errors have been made in diagnosis. In Frestel's case the

symptoms were those of a cyst lying over an artery. Marsh (*Lancet*, 1879, vol. II., p. 838) mentions a case in which there were no pulsations. The tumor was regarded as a sebaceous cyst, and was opened as such.

#### TREATMENT.

**DESTRUCTION OF THE SAC.** This has been attempted with equal success by incision, extirpation, cauterization. 1st. *Incision* (method of Antyllus) has been practiced by D. Monro, A. Cooper, Gasté, Malgodi, Schuh, Hall, Bryant, and Erichsen. All recovered. 2d. *Extirpation* (method of Purmann), practiced by Ballingall, Frestel, and Després. All recovered. The author agrees with Heineke that, with antiseptic dressings, this is the best treatment for superficial aneurisms of the cranium. 3d. *Cauterization*—Murat, according to Bégin (*Dictionnaire de Méd. et de Chir. pratiques*, 1879, article Aneurisms), cured a case of this kind, and perhaps used the actual cautery. The report does not appear to have been published. In two cases, Girouard (Chartres), and Fontaquères (Toulouse), used Canquoin's paste.

**IMMEDIATE COAGULATION OF THE BLOOD IN THE TUMOR.** This has been applied in three forms: 1st. Twisted sutures. 2d. Galvano-puncture. 3d. Coagulating injections.

1. *Twisted Suture*, which Rizzoli has attempted to popularize, had already been employed by Malgaigne, in 1846. Malgodi had, indeed, tried it anteriorly to that date, but it was at the end of an operation by the old method, to prevent secondary hæmorrhage, in which it did not succeed. He concluded that it was not a bad procedure.

2. *Galvano-Puncture*, suggested by Guérard and Pravaz, succeeded with Petrequin, in 1845, and was the first application. It is strange that it has not been more frequently used.

3. *Coagulating Injections*, proposed by Monteggia for the treatment of aneurisms, was first applied in the cases under discussion by Pavesi, in 1854 (*Gaz. Med., Lombardia*, 1854). He injected fourteen drops of a solution of acetate of iron. The tumor was solid in 10 minutes, and from that moment began to decrease. The method has been tried many times in these cases of temporal aneurisms, and has never produced any accidents.

METHOD OF COAGULATION OF THE BLOOD IN THE TUMOR BY ACTION UPON THE WALLS OF THE SAC. This method comprises two orders of procedure, one immediate—that is to say, acting immediately upon the wall of the sac by immediate compression; the other, mediate—that is to say, acting upon the sac only through the soft parts and the integuments, as in refrigeration and mediate compression.

*Immediate or Sub-Cutaneous Compression* is applicable to very small aneurisms. Fleming passed, as deeply as possible, under the tumor a curved needle, armed with carbolized silk, and brought it out half an inch from the point of entry. The ends were knotted and tied to an India rubber tube. The pulsations became imperceptible in two hours, and the next day the tumor was solid. The claimed success of *refrigeration* is to be received with caution.

*Mediate Compression* has given the greatest and the most authentic success. The pad placed upon the tumor should be soft, such as amadou. Under this treatment, the tumor reduces slowly, and after some days ceases to beat.

INDIRECT METHODS. 1st. *Ligature of the Temporal*. Success has not answered the expectations, owing to the anastomotic branches on the opposite side.

2d. *Ligature of the Common Carotid*. A proceeding which is too grave, and is not always successful.

III. AND IV. *Deep Aneurisms of the Temporal Region*. Under this title must be placed two kinds of tumors—aneurisms of the deep temporal, and perforating aneurisms of the middle meningeal artery. No proof of the existence of these tumors has been produced up to the present, and the minute researches made by the author lead him to believe that their existence has only been admitted upon the faith of erroneous observations.

*Aneurisms of the Deep Temporal*. Orioli is the first to refer to this form (*Bulletino delle Scienze Med.*, di Bologna, 1834, et *Gaz. Médicale*, 1834, p. 410). He erroneously diagnosed an aneurism, but on cutting through the temporal muscle, discovered a fungous tumor of the dura mater, which had perforated the skull. Dupuytren, Vidal de Cassis, and Velpeau refer to a case which is evidently the same. Velpeau also alludes to a similar case, in his own practice. These negative or



ambiguous observations have served to create a legend of aneurisms of the deep temporal, but there is no proof.

*Aneurism of the Middle Meningeal.* These aneurism are more frequent and more authentic. Nine cases are reported; but here, again, one has evidently been three times placed on record and referred to different surgeons. A careful consideration of all the cases leads the author to believe that the existence of perforating aneurisms of the middle meningeal ought to be, if not denied, at least doubted, until there are new observations showing their reality from *post-mortem* examination.

V. *Arterio-Venous Aneurisms of the Temporal Region.* Eleven reliable cases have been placed on record. They are always traumatic, and in their production, arteriotomy holds first rank. The first sign is the tumor; it appears shortly after the wound, accompanied by a peculiar thrill, of which the patient is conscious, and synchronous with the pulse. There are seen under the skin dilated and hypertrophied pulsating veins. Their volume may become enormous, and sometimes mondifform dilatations are formed. The sac and the venous dilatations increase very rapidly in the first month, but afterwards progress is extremely slow, or even nothing. Czerny's patient lived 25 years without any increase after the first year.

These tumors are most frequently confounded with cirroid aneurisms. Bérard attaches great importance to the traumatic origin of the latter; while cirroid aneurism is almost always spontaneous and congenital. That is true in the majority of cases, but the origin of arterial varices is frequently traumatic. There is, in reality, only one characteristic sign of arterio-venous aneurism—that is, the detection of a limited point, the compression of which causes all movements to cease (Czerny); but this is difficult, and frequently impossible to discover.

As to treatment, the author recommends ligature of the artery above and below the sac. If this cannot be done, then either to tie all the veins and arteries which belong to the tumor, or to extirpate it, tying all the bleeding vessels with catgut, and rigorously observing antiseptic precautions.

WILLIAM THOMSON.

## INDEX OF SURGICAL PROGRESS.

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### General Surgery.

I. PARAPLEGIA IN SYPHILIS. By J. HUTCHINSON, F.R.S. (London.) Perhaps the most striking feature of this lecture is the statement that for many late syphilitic lesions iodide of potassium, if taken until the morbid process is completely arrested, is as permanent a cure as a course of mercury. To confirm this, the author adduces two cases of paraplegia from acquired syphilis, in adults, which recovered to a great extent under iodide alone, and in whom no relapse occurred, in one case, during the long period of twenty-six years.

The author, in fact, regards both drugs as equally efficacious in many syphilitic nervous diseases, as well as in some other specific manifestations, if only they are late or tertiary ones. But since iodide depresses more than mercury, he advises the trial of the latter in all doubtful cases, to be rapidly pushed until slight pyalism be produced.

The two cases recorded presented many features in common, and resembled strongly the one described by Dr. Buzzard (*Diseases of the Nervous System*, p. 401). Paralysis of the lower limbs, in both motion and sensation, was for a time almost complete, accompanied by incontinence of urine and feces. Sexual power in both cases was never regained, and in one incontinence of urine persisted—*i. e.*, the most complex functions of the cord were the ones most permanently affected.

Mr. Hutchinson suggests as the cause a meningeal gumma pressing on the cord; Dr. Gowers (in *B. Hill on Syphilis*, p. 249) lays stress on the fact that the prognosis in syphilitic paraplegia is much more hopeful when the cause is a gumma than when meningitis or myelitis is present—that is, when the symptoms are due to pressure rather than to inflammation. It is interesting to note that so long ago as 1819 M. Houstet records a case of complete cure by mercurial inunction of syphilitic paraplegia, impotence, and loss of power in rectum and bladder. The patient was a man, aged 30, and the affection was then ascribed to “obstruction to the nerves as they leave the lumbar and sacral vertebrae.” Several similar cases are recorded in M. Lagneau's *Maladies Syphilitiques*.

Mr. Hutchinson concludes by expressing his belief that the influences producing some nervous disorders ascribed to syphilis are in many instances more complex, and that sexual excess is not a very infrequent one. He was consulted by a man who at the age of 20 was treated for a chancre; no rash followed until about eight months later, but from certain later symptoms there seemed to be little doubt that he was syphilitic. When aged 40, he developed certain symptoms pointing to ataxia,

reeling gait, attacks of severe pain in the back, and "liability to catch cold in the bladder"; but some of the characteristic features of the disease have always been wanting in him.

Under large doses of iodide of potassium the nervous symptoms improved somewhat, but for thirteen years they have remained almost stationary. There was a clear history of great sexual excess in early life.

One deduction from the lecture is that a wholly favorable prognosis should not be given in many nervous disorders (especially degenerative), although a history of syphilis be obtained, and although specific treatment be fully carried out.—*Med. Times and Gaz.* 1885. March 7. J. HUTCHINSON, JR. (London.)

## Operative Surgery.

I. NEW OPERATION FOR NASO-PHARYNGEAL OR FIBROUS POLYPUS. By FURNEAUX JORDAN, F.R.C.S. The leading principle of this operation is to completely uncover the bony orifice of the nasal cavity. This is done by making a triangular flap out of the upper lip and the side of the nose. A curved bistoury is carried under the lip into the affected nostril, and made to cut its way out. Then the soft part of the nose is divided on one side of the middle line in a line with the incision in the lip. A few touches of the knife permit the flap to be turned well outwards. The nasal cavity is found expanded, well defined, and open to any sort of manipulation. To-and-fro traction by one or two fingers in the pharynx, and one or two at the front, aided, perhaps, by snips of scissors or knife, readily detach the tumour. If the bone opening be found to be too small, it should be enlarged by strong bone forceps. Delicate adjustment and sutures leave scars so fine, that only resolute search can find them.—*Brit. Med. Journ.* 1885. May 5.

H. H. TAYLOR (London).

II. AMPUTATIONS AND EXARTICULATIONS PERFORMED DURING THE LAST TEN YEARS AT THE SURGICAL CLINIC AT ERLANGEN. By EHRENFRIED CRAMER (Schwerin). In this paper, chiefly statistical in interest, the author adopts Volkmann's classification, and considers the cases under the following headings: Amputations (1) in non-complicated cases, (a) for injuries, (b) for disease; (2) in complicated cases, (a) in which sepsis had already obtained; (b) in which double amputation is necessary; (c) in which other injuries exist; (d) in which the patients succumb to other diseases. After elucidating the above principles as applied to his cases, the author proceeds to give the complete histories, although in a concise form. The list consists of 192 cases in all, comprising 62 amputations of the thigh alone, 47 of which were non-complicated, and 19 of the fingers and metacarpus. The mortality percentage is 6.0 per cent. in the non-complicated cases, and 40 per cent. in the complicated ones, two cases of the former having died of pyæmia, one of erysipelas, and one each of poisoning by carbolic acid and iodoform; in the latter the deaths were due to septicæmia, but this condition had pre-existed.

The amputations were indicated in 43.2 per cent. of the cases by tuberculous dis-

ease, and 40.3 per cent. of the amputations of the thigh were performed for tuberculous knee-trouble. Twenty-six cases of tumor are recorded; 31 amputations for injuries, of which 12 were complicated, and 8 for septic processes.

The antiseptic method was used during the whole of the period referred to; Es-march's bandage, drainage tubes, disinfection, sutures and antiseptic dressings being applied. The spray was dispensed with in 1881. Iodoform has been in use since that time, and since the year 1882 corrosive sublimate has been exclusively used, and, of late, peat cushions with sublimate.

The effect of the antiseptic dressings is demonstrated by comparisons of the results obtained in periods of three years each. While at first the relation of perfect primary unions to secondary ones was as 5 to 7, latterly the relation has been reversed, and is as 9 to 5. In like manner the time of healing of the wounds has become shortened.

The methods of amputation differed somewhat in the cases, but most frequently only one flap was made, consisting of skin, fascia, and of a thin muscular layer. The periosteum was separately sutured.

The article contains, besides its statistical information, many very interesting remarks interspersed throughout, and especially in the chapters on the indications for operation and on the healing of wounds.—*Deutsch. Zeitschr. f. Chirurg.* Bd. XXI. Hft. 5 & 6. 1885. March 9. W. VAN ARSDALE (New York).

III. DEVICE FOR FIXATION OF THE BONES AFTER RESECTION OF THE KNEE-JOINT. By C. K. BRIDGON, M D. (New York). The method consists in the driving in of four nails, each about three inches in length, two in the sides of the lower end of the femur and two in the sides of the upper end of the tibia, and suturing them with copper wire. The nails should be driven in about half an inch from the cut surface, and they should be left projecting about an inch and a half, to prevent the copper wire from becoming buried in the integument. It was also important to approximate the skin-flaps before driving in the nails. The nails were held firmly in position by making a figure-of-eight loop around them close to their heads, and in the two cases in which he had employed this method immobilization was complete.

Dr. McBurney said the method appeared to do away with one objection which had been urged against nails, as it seemed applicable to cases in which the ends of the bones had been largely excavated by abscesses.—*Proceedings New York Surg. Society.* 1885. April 14.

IV. OPERATIONS FOR RELIEF OF STRANGULATED EXOMPHALOS. By T. F. CHAVASSE (Birmingham). In attempts to relieve strangulated umbilical herniæ, a small incision above the neck of the sac should first be made, with an attempt to make an extra-peritoneal division of the upper border of the ring; but, this failing, an intra-peritoneal one in an upward direction, and a reduction of only a portion of the sac's contents. This method of operating offers chances of a successful issue vastly more favorable than a free incision of the sac, a complete exposure of its contents, and a coarse manipulation of the same in efforts made to return all into the cavity of the

abdomen after the constriction has been overcome.—*Birmingham Med. Review*. 1885. July.

V. ATROPIA AS A REMEDY IN ETHER NARCOSIS. By R. W. AMIDON, M.D. (New York). The author is of the opinion that when death is occasioned by ether narcosis, its cause is a combination of asphyxia and syncope, the failure of respiration being more prominent and primary. Clinicians have been apt to underestimate the respiratory failure, and rely on cardiac stimulants, to the neglect of artificial respiration. The improvement often witnessed after the administration of cardiac stimulants, as hypodermics of alcoholic liquids, is due rather to the simultaneous withdrawal of the ether and the admission of more air. The author recommends the use of respiratory stimulants rather than cardiac, and for this purpose selects belladonna. He supports his theory by experiments on animals, as the result of which he concludes that atropine, while it does not impair the anæsthetic power of ether, lessens its asphyxiating tendency in a marked degree; also, that when the stage of asphyxia has commenced, the respiration has ceased, and the heart is failing, a timely large dose of atropia may save life. Whenever, during the later stages of anæsthetization, the respiration becomes embarrassed, the pulse begins to fail, and other alarming symptoms occur, if the respiration does not improve at once upon the withdrawal of the ether, and the drawing of the tongue and jaw forward, the author advises that .002 sulphate of atropia be given hypodermically, while heat is applied to the limbs and over the heart. If improvement does not occur in two minutes, repeat the dose. If cessation of the respiration has occurred, immediate mechanical artificial respiration, the method of Silvester being the best, is to be resorted to, and .003 of the atropia to be given hypodermically; this to be repeated after a minute, if signs of recovery do not begin to manifest themselves. Should the subject be plethoric and no large hemorrhage have taken place, a free venesection would be of great service.—*The Med. Record*. 1885. May 2.

## Head and Neck.

I. EXPERIMENTAL INQUIRIES CONCERNING FRACTURES OF THE BASE OF THE SKULL. By W. GREDER. Hermann caused fractures by compressing the skull in a vise, and found that the fracture of the base of the skull always had a direction parallel to the direction of the pressure, that the fracture commenced at the point of pressure and continued to the base, and that almost all of the fractures of the base of the skull were, in character, direct ones.

The author, however, following von Wahl's reasoning, made use of a different apparatus for his experiments. He arranged a weight varying between 6,400 and 7,650 grams to slide on an iron bar, which could be directed to any given spot on the skull-surface. The weight was let fall a distance of 170 centimetres. With this he executed from one to four blows on the skulls, and gives the results in 96 handsome chromo-lithographs.

In discussing the results he first inquires as to the cause of the fracture of the

base, the laws governing the direction of the fractures, and the extent of the fractures.

In a preliminary argument he discerns between the expression fracture *per se* (Bruch) and a crack (Sprung). A break, or fracture, occurs at the point where the energy is directly applied; a crack occurs at a point more or less removed, and where the relative resistance is the least. Breaks and cracks are due to forces acting at right angles to each other.

The author performed 29 experiments in all; in 8 of these he obtained true breakages, but these showed cracks as well. Two fractures were achieved by forcing the spinal column into the skull with the help of an interesting apparatus, producing direct "ring" fractures.

In 4 cases no cracks were obtained. In 8 cases isolated cracks appeared. In 4 cases the elasticity and resistance of the skull were artificially altered by divisions of bones and wire confines.

The results arrived at by the author are the following:

(1) Experiments as well as cases prove that all longitudinal, transverse, or diagonal fractures of the base of the skull are to be considered as cracks, occasioned by transmitted energy (Berstung).

(2) The direction of fractures of the base of the skull is parallel to the direction of the pressure.

(3) The extent of these cracks depends upon so great a number of conditions that it can only be referred to the intensity of the energy by way of conjecture.

On the whole, the author's views, with the exception of one instance, correspond with von Wahl's deductions on the same subject.—*Deutsch. Zeitschr. f. Chirurg.* Bd. XXI. Hft. 5 & 6. 1885. March 9. W. VAN ARSDALE (Brooklyn).

II. A PECULIAR FORM OF NEURALGIA OF THE INFERIOR MAXILLA, CURED BY RESECTION OF THE ALVEOLAR BORDER. By M. DUPLAY (Paris). Man, aged 33. Has suffered for four years from intense neuralgia on the right side of inferior maxilla. Seven or eight years before the second right inferior true molar was extracted, and three or four years afterwards the neuralgia commenced in the alveolus corresponding to the extracted tooth. All the teeth on that side were subsequently removed, without relief. They were healthy. The gum corresponding to the second right inferior true molar was painful to the touch, and the slightest pressure at this point was sufficient to produce a crisis. This was also determined by depression of the jaw, and by attempts at mastication, and by talking. There was also, during the crisis, a spasmodic contraction of the muscles of the right side of the face, comprising the buccinator, the elevators of the upper lip, and the orbicularis palpebrarum. The right eye was also slightly injected, and watery. The general health was greatly impaired from want of sleep and the difficulty of taking nourishment. Medicines gave no relief. Following the practice of Gross of Philadelphia, who first drew attention to this affection in 1870, Duplay determined to resect the

alveolus corresponding to the tender spot. This was done, and the patient left in about a fortnight, well.

In a case reported by Denucé of Bordeaux, an examination of the dental canal at the position of the first true molar, revealed a bend which narrowed its calibre, and exercised a constant pressure on the nerve. The pathology of this affection is yet uncertain. Gross attributes it to the compression of the fine nerve filaments of the alveolus by deposition of osseous matter in the small canals. Duplay concurs in the view that the lesion does not extend beyond the alveolus, but suggests that, instead of resulting from a sclerous osteitis, it may proceed from small, painful neuromata as are sometimes observed after amputations. This hypothesis has the greater force from the fact that this form of maxillary neuralgia has always its origin in the alveolus of an extracted tooth.—*Archives Générales de Médecine*, t. ii., 1884, page 601. (See also Gross, *Journal of Medical Sciences*, 1870; *Archives Gén. de Méd.*, 1870, t. ii., page 542; Denucé, *Mém. et Bulletins*, t. iv., p. 123, 1869.)

W. THOMSON (Dublin).

III. LARYNX OPERATIONS IN BILLROTH'S CLINIC, 1870-1884. By Dr. F. SALZER (Vienna). S. first details and tabulates 11 cases of opening the larynx (*Laryngofissio*) on ten persons, 9 males and 1 female, including 8 cancers, 1 rhinoscleroma, 1 cicatricial stenosis, and 1 tubercular ulceration (cancer, however, diagnosed). A favorable course in 8; one died from acute pulmonary œdema, 13 hours after operation; one, a week later, of pulmonary tuberculosis, and one from pyæmia. In 9 the wound surface in larynx was large; 5 of these healed without fever, and in these tracheotomy, Trendelenburg's tampon-canula, plug of iodoform gauze, and permanent tracheal tube were in requisition. Later results known in only 4 of the cancer cases. In 1, no recurrence after lapse of  $2\frac{3}{4}$  years; in the others, relapse after 1, 2 and 13 months, respectively. Removal of the rhinoscleroma gave desired result, patient speaking with artificial larynx. The relief in the case of cicatrix lasted 5 years. Of 6 cases, in which one vocal cord was not diseased, 3 regained a hoarse, resonant voice, the other 3 only a whisper.

*Partial Resection of Larynx.* Six cases of removal of  $\frac{1}{2}$  of thyroid cartilage, and 1 of extirpation of part of epiglottis, and a third of right half of the cartilage (fatal case). In all, a tracheotomy previously. He puts down 5 as cured, although 1 of these died of relapse  $1\frac{1}{3}$  years later. The 2 remaining cases died in about 6 weeks from sepsis, 1 from pneumonia. Relapse found in one after 6 months, in one after 4 weeks, and in a third after 7 weeks. In one 2 months, and in another 4 had passed without any recurrence.

*Total Extirpation of Larynx.* Five cases, 4 of cancer. One cured and died of relapse 7 months later; one died from broncho-pneumonia in 3 days, one from pneumonia in 3 days, one from late hemorrhage, and one, after 5 weeks, from sounding œsophagus.—*Arch. f. klin. Chirg.* 1885. Bd. 31. Hft. 4.

IV. ON THE QUESTION OF THE MECHANICAL TREATMENT OF LARYNX-STENOSES. By Dr. A. JACOBSON (St. Petersburg). Two classes of cases; 1 where our endeavor

is to avoid tracheotomy, while effecting a thorough cure; 2 where tracheotomy has been resorted to.

He, of course, gives an historical sketch of treatment in such cases, as developed by Liston (1827), v. Langenbeck (1855), Trendelenburg (1870), and Schrötter. He adopts the perfected method of the latter in its entirety, and bases his statistics on Hering's report to the London International Congress, wherein 100 cases are collected.

In one of J.'s own cases, the cure of a syphilitic stenosis (tracheotomy 2 years before), was permanent  $3\frac{1}{2}$  years later; in fact, it had rather improved meanwhile. In a second syphilitic case (also tracheotomy), there was improvement for some time, but after 9 months' treatment patient was lost sight of. The third case was one of chronic hypertrophic laryngitis—cure, without tracheotomy, in about 2 months. Fourth case, syphilitic, died suddenly from œdema glottidis, while in treatment. His cases have been previously reported, at least in part, in Russia.—*Arch. f. klin. Chirg.* 1885. Bd. 31. Hft. 4.

W. BROWNING (Brooklyn).

V. CASE OF BULLET-WOUND OF THE TRACHEA; DEATH FROM EXTENSIVE CUTANEOUS EMPHYSEMA, IN SPITE OF TRACHEOTOMY. By Dr. RYDYGIER (Culm).

A lad, 17 years of age, was hit in the neck by the bullet of a parlor-gun, discharged at a distance of 10 metres. He walked to his home, 4 miles distant. Only a small wound of the size of a pin's head being visible, and no dangerous symptoms appearing, he was ordered cold applications. The following morning the side of his neck appeared slightly emphysematous. Tracheotomy was advised, but was not permitted till the afternoon, when the emphysema of the skin had become greatly developed, and respiration had become embarrassed. In spite of the performance of the inferior operation of tracheotomy and the insertion of a canula below the wound, the emphysema of the skin increased, and death ensued.

The post-mortem revealed the passage of the bullet through the lig. crico-thyroid, and through the third tracheal cartilage at the back, from whence it was deflected downwards along the spine, also injuring the œsophagus. Bloody serum was found in the pleural cavity.

The author points out the singularity of death occurring from emphysema, although the passage of air to the lungs was quite free through the canula.

The temperature had never risen above  $38^{\circ}$  c.—*Deutsch. Zeitsch. f. Chirurg.* 1885. Bd. XXI. Hft. 5 and 6.

W. VAN ARSDALE (New York).

## Chest and Abdomen.

I. OPERATIVE INDUCTION OF PNEUMOTHORAX FOR ARREST OF HÆMOPTYSIS. By Dr. CAYLEY (London). The patient, aged 21 years, a porter, was admitted to the Middlesex Hospital, on February 9th. Cough for some time previous. On February 7th, he had sudden hæmoptysis, which recurred the next morning and following night, and immediately after his admission he brought up 4 ozs. of florid blood, in all about one pint. Left side of chest was flattened in front, and expansion much dimin-



ished. Dullness on percussion over scapular region, and in this region there was feeble bronchial breathing. The breath sounds all over this lung were faint and accompanied by moist râles. On the right side the physical signs were normal. He had now brought up in all nearly one gallon of blood, and as it was evident that much repetition of the hæmorrhage must prove fatal, it being, in all probability, due to a pulmonary aneurism or ulceration of a large vessel, it was determined to induce artificial pneumothorax, in the expectation that the great diminution of the circulation through the collapsed lung, together with the pressure exercised by the air, would arrest the hæmorrhage, and supposing there was active development of tubercle in progress in the lung, this would probably for a time be checked. An incision was made in the sixth intercostal space, an inch behind anterior fold of axilla, and introduced into the pleural cavity a double tube, made by uniting together by a shield two pieces of elastic catheter, about three inches long. The opening was protected by antiseptic gauze. The air passed freely in and out at the time of the operation, and the apex of the heart moved over to the mid-sternal region; respiration became more accelerated. There was no return of the hæmorrhage, but on March 15th he died quite suddenly, apparently from syncope. After death, both lungs were found studded with recent gray miliary granules. The right lung was free from any old tubercular disease. In the apex of the left lung was a very small old vomica, with smooth walls and some puckering around it. The lower lobe and lower part of upper lobe were collapsed, and the pleural surface smeared with recent lymph. The pleural sac contained about two drachms of non-purulent fluid. In the lower part of the upper lobe, close to the interlobular septum, which was bulged downwards by it, was a cavity the size of a walnut, filled, except at its centre, by a light-colored laminated clot, so as closely to resemble an aneurism. In the centre of this clot was a small round cavity, containing a little loose black coagulum, and this cavity communicated with a considerable branch of the pulmonary artery. A large bronchial tube opened into the periphery of the pulmonary cavity, but was shut off by the laminated clot from the central space. At the upper part, this clot was softer and more recent than elsewhere. The cavity in the lung containing the clot was smooth walled, but showed no signs of any aneurismal sac. The patient did not live long enough to warrant positive conclusions as to the effect of the operation in arresting the hæmorrhage. He had two slight attacks in the following night, but there was no subsequent recurrence.—*Lancet*. 1885. May 16.

H. H. TAYLOR (London).

II. A CASE OF RIGHT-SIDED CHYLOTHORAX FROM RUPTURE OF THE THORACIC DUCT, WITH STATISTICS AND CRITIQUE OF PREVIOUSLY KNOWN RELIABLE CASES. By Dr. KIRCHNER (Hannover). Girl of 9 years; weakly, though healthy until a week previous. Two weeks previously, in play, she was pushed against a window sill, striking the front of the chest, opposite third rib. This caused severe pain, lasting some days; after this had subsided, difficulty in breathing set in and continued to increase. Exploratory puncture on the right showed a thin white fluid with a slight yellowish tinge. Two days later, he drew off a liter of like milky fluid.

Severe attack of coughing immediately after. Great relief. Dullness still reached to upper border of 5th rib in front. Microscopically, the fluid showed much oil in larger and innumerable smaller globules; small, colorless, round cells, partly granular, partly not, and mostly nucleated, forms closely resembling colostrum corpuscles, etc. Appetite returned, and in a few days the exudation also. Ten days later, very dyspnoeic, and arranged to tap on following day. Warm bath, and internally senna infusion. Next day, however, dyspnoea had vanished, and the line of dullness was lower. Gradual improvement, without further special treatment, and when seen 4 months later, she was in the best of health. The dullness had vanished.

The child had eaten a large breakfast 4 hours before the accident. He considers that duct (and pleura) was ruptured by contrecoup, as occasionally happens to the middle meningeal artery. If the duct had a normal course, rupture must have occurred some where from 4th to 10th dorsal vertebrae. He does not think it was a double duct, but that the tear was small. Very likely the cure was by thrombosis, with development of collateral passages, as in two of Cooper's cases of closure of this duct.

He then reviews 10 cases, gathered by Boeghold (*Arch. f. Chirg.*, vol. 29), some of which are doubtful, and adds other scattering ones, making a total of 17 possible cases of injury to this duct, 9 resulting in chylothorax, 6 in chylous ascites, 1 (very questionable) in exudation into mediastinum, while one was an operative injury of the duct near its mouth. Of the 8 cases of chylothorax, 6 were on the left and 2 on the right. But one of the 6 on the left is unquestionable, while both on the right are. The 6 cases of chylous ascites are trustworthy. Causes were, twice contusion of chest; once each, puncture, cut, shot wound; 8 times indefinite, 3 erosion from supuration, and 5 in which simply stated to have ruptured.—*Arch. f. klin. Chirg.* 1885. Bd. 32. Hft. I.

W. BROWNING (Brooklyn).

III. ANATOMY OF THE INTESTINAL CANAL AND PERITONEUM IN MAN. Three lectures delivered at the Royal College of Surgeons, London, by F. TREVES, F.R.C.S. These lectures contain many points of interest, from a surgical point of view, as well as much that is valuable in the anatomy and physiology of the parts treated of.

Beginning with the length of the intestines, the author gives the average length of the small and of the great intestines in a hundred subjects of both sexes. What is of interest to note is that, while there is a variation of 15 feet between the extremes of length of the small intestine and 3 feet 3 inches between the extremes of length of the large intestine, there does not seem to be any relation between the length of these two parts of the intestine to one another; and further, "that the length of the bowel is independent in the adult, at least of age, height, and of weight." The author suggests that physiological rather than morphological factors may yet be shown to afford the clue to these variations, and draws attention to the irregularity in the length of the growing small intestine, which he found to exist in children, after two months old. The difference in the diet and digestive activity of children is well known, and may account for the length of the small intestine; whereas, in the great

intestine, whose functional activity is much less, this variation is absent, the colon elongating regularly with the age of the child. The elongation itself was found to be rather an adjustment of the relative lengths of the colon and sigmoid flexure than a real growth of the intestine itself.

With regard to the duodenum, the presence of a terminal vertical part of "never less than an inch in length" was confirmed by the author as constant in the human subject. The fossa duodeno-jejunalis is very minutely described in regard to its position and variations, frequency and mode of causation. As its name indicates, the fossa lies at the junction of the duodenum and jejunum, and is formed by a double fold of peritoneum passing between the terminal (vertical) part of the duodenum and the left side of the posterior abdominal wall. "The pocket or fossa formed by this fold is of triangular outline, with its base above. The opening of the fossa looks directly upwards. Its apex extends below the bend of the duodenum, a fact of significance in connection with the development of the fossa. The anterior wall of the pocket is formed entirely by the fold; the posterior wall is formed by the posterior parieties and part of the duodenum—both covered by peritoneum. The capacity of the fossa varies greatly. In well marked specimens it has a vertical depth of  $1\frac{1}{2}$  inches, and will lodge the thumb to the first joint. It will often take only the point of the little finger, and in some instances will readily receive two fingers as far as the first joints. The fossa normally lodges the duodeno-jejunal bend; and the production of a retro-peritoneal hernia, by the protrusion of additional gut into this pouch of peritoneum, can be readily understood."

In the 100 bodies examined, the author found 48 examples of this fossa; there were many varieties. Sex did not seem to affect its formation. As regards its mode of formation, the inferior mesenteric vein was excluded. The development of this part of the intestinal canal was thoroughly discussed, and reference was made to comparative anatomy. The conclusion arrived at may be briefly stated, as that the fossa duodeno-jejunalis, when it exists, is the remains of the original meso-duodenum, the most of which has been drawn out by the growth of surrounding viscera, but a part of which still remains to form the pouch in question.

Surgically, this pouch may give rise to a form of retro-peritoneal hernia, in which, as described by Sir Astley Cooper, "the whole of the small intestine, with the exception of the duodenum, is hidden from view, and occupies a large sac that is formed in the middle of the abdomen, and surrounded by the large intestine." In the other form of retro-peritoneal hernia, described by the same author, under the name of meso-colic, "the small intestine was contained within a sac that formed a tumour to the left of the middle line, and that had been evidently developed at the expense of the peritoneum leading to the descending colon." Mr. Treves considers that this form of hernia is not due to an enlargement of the duodeno-jejunal fossa, but to that of a pouch, which is occasionally formed by a branch of the inferior mesenteric artery, in the parietal peritoneum, leading to the descending colon. "The mouth of the pouch is directed upwards. Such a fossa could readily engage a loop of

"small intestine, more readily even than the duodenal fossa; and when a retro-peritoneal hernia, so originating, had been fully formed, then the three features . . . already alluded to would be clearly marked . . . ; the orifice of the sac would be some way from the duodenum; the commencement of the jejunum would not be involved, and a branch of the inferior mesenteric artery would be found skirting the orifice of the sac on its anterior aspect."

The mode of formation of the *Mesentery* is carefully explained from a comparative anatomy and developmental point of view. Some practical points in regard to its length may be quoted. "The longest part of the mesentery is that which goes to the coils of the intestine that lie between a point 6 feet from the duodenum, and a point 11 feet from the same part of the gut. Such coils will, therefore, include 5 feet of the intestine, and the mesentery here not infrequently reaches the length of 10 inches." Normally, however, it is found that "no coil can, in any part, be drawn out of the abdomen below a horizontal line on a level with the spine of the pubes. It is evident, therefore, that in a femoral or scrotal hernia, the mesentery must be elongated." Exceptions to this were found in elderly persons, especially in females, but very seldom in males at the prime of life. An explanation of certain *holes in the mesentery*, which may give rise to fatal strangulation of the intestine, is given. Mr. Treves, on examining museum specimens of these abnormalities, and published accounts of strangulation by their presence, found that they had the following characters in common: "The holes were round; they were situated in the mesentery of the terminal part of the ileum; their margins were distinct, being often thickened and opaque, and around a part of the margin it was not uncommon to find one of the terminal branches of the superior mesenteric artery." On examining the mesentery of a large number of fetuses, it was found that an area exists very frequently between the terminal branches of the intestine vessels and the ileo-colic artery, which is bloodless, thin, and devoid of fat. In one adult specimen such an area was found, with the serous membrane thin, clear, and atrophied, so as to be at places cribriform, while the margin was firm and opaque. "A slight degree of force would have been required to have forced a knuckle of bowel through this wasted membrane, and so have produced a strangulation of the bowel through a mesenteric hole." Careful observations were made to determine whether or not an exact relation of the coils of the small intestine to the abdominal wall could be made out as constant. Except, however, that the general direction of the superficial coils of the small intestine is similar to that of the mesentery, nothing definite could be determined. The coils of small intestine most usually found in the pelvis belonged to "the terminal part of the ileum, and to that part of the intestine that has the longest mesentery—the part, namely, that extends between two points, respectively 6 and 11 feet from the end of the duodenum. It is not, therefore, uncommon to find loops lying together in contact with the pelvic floor that are in reality some 12 or 14 feet apart, as may be seen when their proper position in the course of the bowel is defined."

The varying forms and modes of formation of the cæcum were discussed. As to its covering of peritoneum, Mr. Treves, contrary to the usually accepted view, never found any instance of a meso-cæcum, nor of the posterior surface of the cæcum being bare of peritoneum, and attached to the iliac fascia by areolar tissue. In all cases, the posterior, as well as the other surfaces of this part of the intestine, was invested completely by peritoneum.

The reflection, on to the posterior abdominal wall, took place at a variable point. most frequently it was after the cæcum had passed into the ascending colon, at a point about 4 inches from the tip of former. Upon this measurement, and also upon the presence or absence of a meso-colon, depends the frequently considerable mobility of the cæcum.

Some interesting details were given as to the modes of ending of the small intestine, and as to the position and relations of the vermiform appendix, and the attachment of its mesentery. Minute descriptions were also given of the ileo-cæcal fossæ, but the special interest of all these is anatomical rather than surgical. After considering some of the varieties in the position and relations of the ascending colon, Mr. Treves gives the result of his observations of the peritoneal coverings of the ascending and descending colons; but of the 100 bodies observed, in 52 "there was neither an ascending nor a descending meso-colon. In 22 there was a descending meso-colon, "but no trace of a corresponding fold on the other side. In 14 subjects there was a "meso-colon on both the ascending and the descending segments of the bowel; while "in the remaining 12 bodies there was an ascending meso-colon, but no correspond- "ing fold on the left side. It follows, therefore, that in performing lumbar colotomy, "a meso-colon may be expected upon the left side in 36 per cent. of all the cases, and "on the right side in 26 per cent." Passing over the varieties in the curves of the great intestine, we may refer to the simple and satisfactory description which was given of sigmoid flexure and first part of the rectum. "The segment of gut, termed the "sigmoid flexure, and the first part of the rectum form together a single, simple loop "that cannot be divided into parts. This loop begins where the descending colon "ends, and ends at the commencement of so-called second piece of the rectum; at "the spot, in fact, where the meso-rectum ceases, opposite the third piece of the "sacrum. This loop, when unfolded, describes a figure that, if it must be compared "to a letter, may well be compared to the capital Omega." This loop usually lies in the pelvis, but rises out of that cavity when distended, and is found successively in the right iliac, and umbilical regions, and in great distension may even touch the right lobe of the liver.

These important lectures are concluded by a description of the "Inter-sigmoid fossa," which is shown to be a pouch in the mesentery, holding the omega loop to the posterior abdominal and pelvic wall. The mouth of the pouch looks upwards, and its long axis is downwards and to the left. It is usually large enough to lodge the fore finger up to the first joint. It was present in about 50 per cent. of the cases observed. "Two cases of strangulated sigmoid hernia, in the inter-inguinal fossa.

"have been recorded—one by Lawrence, and one by Mr. Eve, in the Erasmus Wilson lectures, delivered at the Royal College of Surgeons, in 1884.—*Brit. Med. Journ.* 1885. Feb. 25, *et seq.*

IV. ABDOMINAL SECTION IN THE TREATMENT OF ACUTE PERITONITIS. By F. TREVES, F.R.C.S. (London). It is especially those acute forms of general peritonitis which depend on external violence or on perforation—whether from injury, abscess, or ulceration—that are referred to. The author alludes to the usual fatality of such cases, and directs attention to the valuable results of incision and free drainage in joint cavities and in the pleura, when acutely inflamed, as a ground for extending similar treatment to the peritoneum. A case was narrated in which acute general peritonitis had followed the bursting of a fetid pelvic abscess in a young woman, the original abscess being the result of chronic pelvic peritonitis set up by severe gonorrhoea. The abdomen was opened under antiseptic precautions, and the peritoneum was found to be acutely inflamed. A quantity of semi-opaque fluid mixed with flakes of lymph and pus escaped. The peritoneal cavity was washed out with many quarts of water, and a drainage tube inserted. The patient made a good recovery.

Mr. Howard Marsh read, at the same meeting of the Medico-Chirurgical Society, an account of a case where extensive peritonitis in a young man was caused by a circumscribed fetid abscess within the peritoneal cavity, the origin of which seemed, however, to be obscure. The abscess pointed to the left of the umbilical region, was opened there, and two or three pints of fetid pus escaped. The cavity was drained and dressed antiseptically, and the patient recovered. The writer was of opinion that the abdomen should be opened only when definite collections of pus might be expected, not when the whole peritoneum was involved.

In a discussion which followed these two papers, the views expressed by Mr. Treves were generally accepted.—*Lancet.* March 14, 1885.

C. W. CATHCART (Edinburgh).

V. CASE OF LAPAROTOMY FOR PERITONITIS FROM PERFORATION—DEATH NINE WEEKS LATER. By Prof. M. OBERST (Halle). Gives several reasons why probabilities of washing out and drainage are favorable only where either there is an encapsulated abscess or no extensive adhesions between the loops of intestines have formed; in the first form good results have been obtained. In peritonitis from intestinal perforation the diagnosis is fairly sure. Mikulicz last year reported such a case operated 72 hours after its occurrence. He removed about a quart of pus, and sewed up a 6x4 cm. defect in a loop of the ileum. Cured.

Oberst reports following case:

Man of 48 years. Scrotal hernia for 22 years. While at hard work he tumbled to the ground, tearing the truss in two. Intense pain immediately. Rupture prolapsed. Several attempts at reduction. Vomiting, etc., ensued. Admitted to hospital in state of collapse four days later. Abdomen distended and painful to touch. Much swelling of right half of scrotum, extending into abdomen. Herniotomy disclosed

feculent matter in the otherwise empty sack. Incision was extended as high as umbilicus—in all some 30 cm. in length. More feculent pus ran from this free opening. Intestines distended, covered with fibrinous exudation, and loosely glued together. Deep down, a loop was found with a hole size of our nickel or sixpence, through which thin feces passed into the abdominal cavity. Here he severed the gut and sewed the two ends to the front wall. Anus præternaturalis. The exudation, pus, etc., was cleaned out as much as possible, the cavity washed with one-third per cent. salicylic acid, deep drains introduced, and the necessarily hurried operation ended by sewing up the incision. Patient's condition did not warrant any attempt at suturing the gut. He began to improve. After first five days, no pain or fever. Washed out through the drains three times daily with the salicylic. At first considerable suppuration. Tubes removed in 14 days. Nutrition, however, proved difficult. Patient lost strength. Hypostatic pneumonia and decubitus hastened the end. Autopsy showed no fresh peritonitis, old enclosed collections of pus along lower border of left lobe of liver, more or less connective tissue adhesions, etc.—*Centhl. f. Chirg.* 1885. May 16. No. 20. W. BROWNING (Brooklyn).

VI. DEEP MESSAGE OF THE ABDOMEN IN THE TREATMENT OF INTESTINAL OBSTRUCTION. By KRIWIAKINE. The history is given of four cases of intestinal obstruction treated by deep massage of the abdomen. In three of these complete obstruction had existed for eight or ten days, and the massage was followed by fecal evacuations—to say the least, embarrassing. The result in each of these cases was good. The fourth case was that of a man, aged 55, who was in a condition of collapse before being seen by K. There had been no action of the bowels for 12 days. Under the influence of massage, however, together with the injection of air into the rectum, the patient had one defecation, and death took place five hours afterwards, from extreme exhaustion.—*Vratch.* 1885. No. 137.

H. P. DUNN (London).

VII. GASTROSTOMY AND ITS RESULTS. By Dr. D. G. ZESAS. No new cases of his own, though two apparently new ones from Lindner. Yet, despite these and some other cases not given by Gross (*v. Am. Jnrl. Med. Sci.*, July, 1884), the latter's collection is much the larger. This obviates quoting Zesas' deductions, though he gives references and some details. Gross added up 207 gastrostomies (167 times for cancerous stricture, 37 for cicatrices). Z. finds but 163, counting an added case (129 and 32 respect. and 2 in syphilitic trouble).—*Arch. f. klin. Chirg.* 1885. Bd. 32. Hft. 1. W. BROWNING (Brooklyn).

VIII. GASTRO-ENTEROSTOMY COMBINED WITH RESECTION OF THE PYLORUS. BILLROTH. B. has many times done gastro-enterostomy when an exploratory operation showed the pyloric disease to be too extensive for its removal, and the after-union of stomach and duodenum to be possible. Sometimes the cases were successful, the patients living for two or three months without pain; sometimes the cases were failures. He has lately made a great advance in a case by first performing gastro-enterostomy, and, secondly, removing the cancerous pylorus without any

attempt to unite the stomach to the duodenum. He merely closed up with sutures the ends of the stomach and the duodenum, so that the latter remained merely as a kind of continuation of the common bile duct, and no longer a passage for food. The patient was doing well five weeks afterwards. Perhaps the main indication for the procedure was the freedom to be obtained from the ill effects of hæmorrhage, and of fetid discharge from the cancer mingling with the food.—*Proceedings Royal Medical Society, Vienna.* Feb. 20, 1885. C. B. KEETLEY (London).

IX. COLOTOMY WITH DELAYED OPENING OF THE INTESTINE. By Mr. DAVIES COLLEY. At the meeting of the Clinical Society of London, on the 13th of March, this paper was read, based on three successful cases of left lumbar colotomy, in which the opening of the intestine had been delayed for one, four and six days, respectively, after the bowel had been found. The object in dividing the operation into two stages was to allow of the beginning of reparative processes in the wound, and thus to diminish risk of peritonitis, or of suppuration in the planes of the connective tissue near the wound. To secure the protruding bowel, and yet prevent extravasation of its contents, or strangulation of its walls, a clamp had been devised, in which two pairs of ivory studs, placed on approximating steel bars, were made to grasp the bowel at two points. In two of the three cases this instrument had been used, and rapid repair, with very little constitutional disturbance, had been the result. The method was suggested as likely to be of service, if it were desired to remove part of the entire circumference of the bowel, either for malignant tumour or as a method of trying to bring about a more serviceable artificial anus than the operation of colotomy usually affords. The loop of the intestine might be drawn out in the first stage of the operation, held there by the clamp, and, in two or three days afterwards, removed, or completely divided, as the case might be.—*Lancet.* 1885. March 21.

X. LAPAROTOMY FOR THE REMOVAL OF A HAIRPIN FROM THE SIGMOID FLEXURE. By T. BRYANT, F.R.C.S. (London). The patient was a somewhat delicate lad, aged 9 years. Six months before admission to the hospital, he had pushed up a hairpin,  $3\frac{1}{2}$  inches long, into his rectum. Two or three days afterwards, he felt pain, but no advice was sought until  $2\frac{1}{2}$  or 3 months had elapsed. "At this time, he was suffering from severe abdominal pain, coming on in paroxysms; sometimes he was 'screaming all night.'" The pin could be just felt with the point of the finger, *per rectum*, but could not be grasped so as to be removed. Up to this time, he had been able to go to school, although now and then obliged to stay at home from the pain. The pain, however, increased, and for  $2\frac{1}{2}$  months before admission to hospital, he had been confined to the house. Thrice during this period he had fainted from the pain, and he suffered much from sickness, and from pain in the lower part of his abdomen, on the left side. There were also sharp, twinging pains in his arms and legs. "After a motion, he is better for a few days. . . . At times he has bladder symptoms, and he has to micturate suddenly; and oftentimes, when in these pains, 'he is very helpless. Sitting over warm water relieves him in these paroxysms. 'Laterly, he has slept in bed, in a sitting posture.'" On admission, the abdomen was



distinctly full in the hypogastric and both inguinal regions; also in the upper part of scrotum and region of pelvis, simulating hernia. Percussion note dull in pelvic region, elsewhere resonant. Both inguinal regions, especially the right, very tender to touch; and a hard body can be made out on the left side, below and an inch internal to the anterior superior iliac spine. Mr. Bryant, two days afterwards, cut directly down upon this hard body; the peritoneum was opened, and the bowel incised over the hard part, which proved to be the pin. It was then extracted. The bowel was sewn up with fine catgut sutures; the wound in the abdominal wall was washed with iodine water, and also sewn with catgut. Dressing of iodoform gauze and cotton wadding was applied. Patient at first suffered from symptoms of peritonitis, and had afterwards a sharp attack of pleurisy and bronchitis. In five days, however, he began to improve, and in three weeks he was discharged, with the wound healed, and otherwise apparently well. During the progress of the case, cold was applied to the wound with one of Leiter's coils. The bowels were moved by an enema on the 11th day after operation.—*Med. Press and Cir.* 1885. March 18.

CHARLES W. CATHCART (Edinburgh).

XI. SURGERY OF THE GALL PASSAGES. By Dr. THEOPH. ROTH (Amrisweil). A 69-page article, containing history and abstracts of the numerous operations on the gall bladder and gall duct, classified references to the various complications and sequelæ of gall stone, to dropsy and empyema of gall bladder, wounds of same, closure of choledochic duct, etc. An elaborate article, but no new cases.—*Arch. f. klin. Chirg.* 1885. Bd. 32. Hft. I.

W. BROWNING (Brooklyn).

XII. CHOLECYSTOTOMY—COEXISTING RENAL CALCULI—DEATH. By G. A. WRIGHT. The special interest of this case is the simultaneous presence of the two forms of calculus, renal and biliary. There was also a distortion of the liver from its place, so that the upper surface looked forwards without any definite symptoms. The patient was a middle-aged man, with history of sudden seizure of pain in right groin two years before admission to the Manchester Royal Infirmary. When admitted under Mr. Wright's care there were no symptoms pointing to hepatic disturbance. There was a fixed pain between right kidney and bladder in front, and sometimes pain in right loin: in the former situation, tenderness on pressure; in the latter, some tenderness on pressure and a feeling of resistance were all that could be made out. The urine was alkaline, but otherwise normal. Diagnosis: calculus—probably in right ureter. Operation on 29th January. Oblique incision from last rib to crest of ilium; enlarged by being carried along last rib and along crest of ilium. The anterior painful spot was found to be due to a biliary calculus—the liver and gall bladder having been displaced. The calculus was removed, and the edges of the cut in the sac sewn to the wound. A hard spot was felt in the pelvis of the right kidney early in the operation, but was not interfered with after the gall stone was removed. Death ensued on the third day from acute peritonitis. Necropsy showed signs of the recent peritonitis. The liver was displaced as noted above, and the gall-bladder was adherent to the abdominal wall nearly as low as the

groin. These changes had apparently been the result of former perihepatitis. There was pyelitis in the medulla of both kidneys, more in the right than the left. In the pelvis of the right kidney was a pyramidal calculus, the size of a hazel nut—apparently of uric acid. Ureters and bladder healthy.—*Lancet*. March 28, 1885.

CHARLES W. CATHCART (Edinburgh).

MIII. A CASE OF CHOLECYSTOTOMY. By Dr. C. T. PARKES (Chicago). Female, aged 29 years, an invalid for two years from frequently recurring paroxysms of hepatic colic. Had been subjected to every known remedial medicine, without relief. Slight general jaundice. Bulging of right hypochondrium, with evidences of enlargement of liver, both by percussion and palpation. An incision, five inches in length, parallel to and two inches below costal cartilages, exposed liver; liver held up by assistant, and distended gall bladder exposed in the wound; gall bladder incised and explored, no gall stones or other source of obstruction found; opening in gall bladder stitched to central part of external wound, with drainage tube carried to bottom of gall bladder; dressed with iodoform, sublimated gauze, and borated cotton. No inflammatory reaction; sound adhesion of margins of gall bladder wound to parietal wound, with formation of permanent fistula; profuse discharge of bile through fistula; rapid subsidence of hepatic swelling; on the fourth day two small calculi were discovered and removed from gall bladder, five more on the second day thereafter. Rapid improvement in general health, subsidence of jaundice, but without any signs of bile being discharged into intestine. At end of four weeks a second laparotomy was done, exposing the common choledoch duct throughout its course. A steel sound, No. 11, was passed through the fistula into the gall bladder, and guided by the finger in the peritoneal cavity, after some manipulation, was successfully carried into and through the common duct into the cavity of the intestine. No calculus was felt. Wound in abdominal wall closed. Bile was soon vomited, and also discharged per rectum, for the first time in two years. Uninterrupted convalescence. Two months later, the time of the report, the fistula had completely healed, and the discharge of bile by the natural channel continued; but some distension of the gall bladder having come on after exposure to inclement weather, it was deemed best to reopen the fistula and maintain within it for a time a small drainage tube. The patient's general health had become quite restored.—*Amer. Journ. Med. Sci.* 1885. July.

XV. THE SURGICAL TREATMENT OF CYSTS OF THE PANCREAS. By Dr. N. SENN (Milwaukee). Of all abdominal organs the pancreas has been least frequently subjected to surgical treatment, for which the anatomical location of this organ, and the obscurity of its affections, furnish a sufficiently satisfactory explanation. Situated high up in the abdominal cavity, and hidden behind such important organs as the stomach, omentum, and transverse colon, it is the least accessible of all abdominal organs, and on this account its affections, wrapped in obscurity, have for the most part constituted objects for empirical medication. The relation of this gland to the surrounding organs, and its great distance from the anterior wall of the abdomen,

the only point of approach, necessarily offer serious obstacles to diagnosis and direct treatment. From a diagnostic point of view, another great difficulty is our want of positive knowledge concerning the physiological functions performed by this gland in the process of digestion. As the symptomatology of all affections of the pancreas is always obscure, and a probable diagnosis can only be made in cases where the gland has become considerably enlarged by disease, it is apparent that our present clinical knowledge is limited to diseases which increase the size of the organ to a sufficient extent to permit its detection by palpation. Primary malignant disease of the pancreas, when it has advanced to such an extent that its presence can be diagnosed with certainty by physical signs, will have invaded the adjacent tissues to such a degree as to preclude the advisability of an operation, consequently the efforts by the surgeon, for the present at least, must be directed exclusively toward the recognition and treatment of benign affections of this gland. Clinical experience does not extend beyond an imperfect knowledge of cysts of the pancreas.

The pancreas, like other secretory organs, is prone to become the seat of cystic tumors, the result of obliteration or obstruction of the common duct, or one or more of its branches. Cysts originating in this manner are true retention cysts, containing the physiological secretion from the distal portion of the gland tissue, with perhaps accidental products, such as altered secretions, blood, and the products of inflammation.

The author presents a full report of a case of retention cyst of the pancreas, which has recently come under his observation, and, at the same time, summarizes, in a compact form, the clinical history of similar recorded cases, which serve as a basis for some general remarks.

In recapitulation, Dr. Senn submits the following conclusions:

1. Cysts of the pancreas are true retention cysts.
2. Cicatricial contraction or obliteration of the common duct, or its branches, and impacted calculi are the most frequent causes of cysts of the pancreas.
3. A positive diagnosis of a cyst of the pancreas is impossible; a probable diagnosis between it and some other kind of cysts amenable to the same surgical treatment is adequate for all practical purposes.
4. The formation of a pancreatic fistula, under antiseptic precautions, recommends itself as the safest and most expedient operation in the treatment of cysts of the pancreas.—*Amer. Journ. Med. Sci.* 1885. July.

## REVIEWS OF BOOKS

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DIAGNOSIS AND SURGICAL TREATMENT OF ABDOMINAL TUMOURS. By Sir SPENCER WELLS, Bart. London: J. & A. Churchill. 1885.

This volume is a fourth edition of the book published in 1865. It is issued at a cheap rate, and in a serviceable form, so as to be accessible to all classes of students. The contents differ somewhat from those of other editions, as "details which were interesting as novelties have been omitted," but nothing of practical value has been expunged. New pages are devoted to the consideration of the surgery of the kidneys, stomach, intestines, liver and spleen, the whole being written from the standpoint of a practical surgeon, rather than that of a pathological investigator. Septicæmia, in spite of antiseptics, is still regarded as the bugbear of abdominal operations, and a state of imperfection is still believed to exist which "calls for continued search for truth and for constant efforts to improve methods of practice, from every surgical student." The monograph is divided into two parts, the first of which deals with tumours arising from the ovary, and its appendages; the second with those originating in the uterus and the abdominal viscera. Part I. considers the classification of ovarian tumours, their diagnosis, the details of the operation of ovariectomy, the treatment before and after its performance, and its subsequent results; also exploratory incisions and oophorectomy. Respecting the last, removal of the ovaries and tubes, except for myomata, does not appear to be a proceeding which finds much favour with Sir Spencer, for since 1878 he has only met with eight patients to whom the operation could be recommended. The statistics of Savage are quoted; these show that in 134 cases in which the uterine appendages have been removed by the surgeon, only six deaths have occurred. But, while admitting that salpingitis and pyo-salpinx do occur, often from gonorrhœa, yet the author's observations lead him to believe that they "usually recover under ordinary care and rest without surgical treatment."

The second chapter in Part II. deals with partial amputation and complete excision of the uterus; the last portion treating of Porro's operation. This is new subject matter, and is founded, in the main, upon P. Clement Godson's experience; but, at the end, Sir Spencer

Wells differs from this authority by predicting that before long the recognized method of treating the pedicle in such cases will be the intraperitoneal one. Chapter III. is devoted to the subject of Extirpation of the Spleen, and contains the record of three fatal cases that have been operated upon by the author. No new light is thrown upon the subject.

Chapter IV. deals with renal operations. Details of cases of Nephrotomy and Nephrectomy of the writer's are given. In the latter operation Mr. Thornton's plan of fixing the end of the ureter outside the abdominal incision is approved of. The remaining three short chapters are devoted to the surgery of the liver (No. V.), to cases of mesenteric, omental and pancreatic cysts, and undescended testicle (No. VI.); lastly, some of the various operations on the stomach and intestines are briefly sketched (No. VII.)

It is somewhat strange to note, throughout the book, the preference shown for quoting continental authorities on statistical and other questions; yet there are many well-known English speaking surgeons who have done much work and given proof of great originality in this branch of surgery, and whose published statistics of operations compare very favorably with those of Sir Spencer Wells. Their names, in the present volume, will be looked for in vain.

There can be no doubt that this book will prove useful to many, especially to those who have yet to learn the *modus operandi* of abdominal surgery; and also that it will be valuable as containing the opinions of a most eminent and successful surgeon and the record of his life's work.

THOMAS F. CHAVASSE.

A TREATISE ON AMPUTATIONS OF THE EXTREMITIES AND THEIR COMPLI-  
CATIONS. By B. A. WATSON, A.M., M.D. Illustrated. Philadelphia: P. Blakiston, Son & Co. 1885. 8vo., pp. 762.

At first glance it is difficult to determine the exact status of this work, and the judgment pronounced by the reader will depend mainly upon his personal acquirements and circumstances. If he possess an extensive library, is well read in ancient and modern surgical literature, and has had considerable experience in surgical work, he will perhaps give an adverse verdict. From this point of view, he will criticise the author's method of giving long quotations from the most prominent and distinguished authorities on the subjects under consideration, instead of merely referring to them, and trusting either to the reader's present knowledge or to his future diligence in consulting the original writings. He will prefer that the volume should have been abbreviated at the expense of full quotations, and that the relation of the personal

experience of one operator should have occupied a larger space. It is evident, however, that the work has not been written for such favored members of the profession. The general trend and object of this volume is well stated by the author in the preface, wherein he says that "he was prompted to undertake the preparation of this encyclopedic monograph, containing the important facts, theories and arguments relating to amputations of the extremities and their complications, in order that he might thus facilitate the study of these subjects by placing before medical students and practitioners, in a single volume, much practical knowledge which is not otherwise accessible to them." Looking at the work from this point of view, which would seem to be the proper one, it undoubtedly contains much to recommend it to those desirous of obtaining information on this branch of surgery. Nevertheless, there is such a diffuseness even about its quotations, such an uncertainty about some of its teachings, and such a lack of direct, positive and detailed directions in those portions that should be the most practical, that its value, even to the student and to the less favored practitioner, is seriously diminished.

The first chapter gives a historical review of the various methods of amputation practiced by the earlier and later surgeons, tracing their evolution from the guillotine and cautery down to the modern amputating knife and catgut ligature. The author is evidently an enthusiastic Listerean, and dedicates his work to the father of antiseptic surgery.

The second chapter relates to conditions affecting the result of amputations, and is a valuable digest of the principles which should guide the surgeon in estimating the probabilities of safe and rapid recovery from an operation wound. Age, sex, habits and functional derangements receive appropriate consideration. The fact that organic disease of the liver and kidneys may exist to such a degree as to seriously militate against recovery, without being sufficient to give rise to obvious symptoms, is strongly emphasized. The practical deduction is insisted on, that a thorough examination of the patient, and especially of the urine, should be made prior to any operative procedure. Hygienic conditions, intemperance, constitutional vices, and hospitalism are also treated of.

Chapter III. embraces nearly thirty pages devoted to a careful, full and judicious discussion of conditions which may cause an amputation to be demanded, to be advantageous, or to be contra-indicated. Wise and conservative advice is given in regard to operations of complaisance, the causes and conditions rendering such operations

justifiable being fairly stated. The time and point at which an amputation should be done is also considered.

Chapter IV., covering some sixty pages, is devoted to some of the preliminary questions to be decided, and the preparations to be made, prior to operation. In comparing the relative advantages and disadvantages of amputations in continuity, and disarticulations, the author contents himself with rehearsing the arguments *pro* and *con*, without ranging himself on either side, but states that a choice must be made with reference to the special and peculiar features of each case. Dr. Watson gives a general description of the methods of forming flaps, preferring the cutaneous to the musculo-cutaneous flap as being less liable to be followed by sloughing and sepsis, but his preference is not very strong, as he lays more stress on the care exercised during and after operation, than on the special method adopted. Regarding anæsthetics, the author is firmly convinced of the almost absolute safety of ether, when properly administered, and the unavoidable danger of chloroform. He reprobates the use of a mixture of alcohol, chloroform and ether, having seen some very unpleasant results therefrom. The sections devoted to the consideration of arrest of hemorrhage, drainage, closure of the wound, and the application of the Protecting Dressings, are all too brief, and lacking in detail. The little that is said on the subject of drainage is neutralized by the introduction of a singular cut, from a French source evidently, which shows very well how a drainage tube ought not to be used.

A hundred pages are devoted to the description of special amputations and disarticulations of the extremities. This section is plentifully illustrated and quite complete, giving directions for performing amputations, and their various modifications, in the language of the original authors. A preliminary study of the treatment of wounds considers the subject of disease germs, their origin, nature, and relation to wounds, with comments on the various methods of after treatment. Dr. Watson's conclusions are summarized as follows:

“1. That there are certain germs in the air, more particularly in the atmosphere of over-crowded hospitals, which, if permitted to enter wounds, give rise directly to living organisms, inflammation, and supuration; and indirectly to all septic conditions which are found as wound complications.

2. “That the successful management of wounds depends principally on the ability of the surgeon to keep the wounds, under all circumstances and at all times, free from germs and living organisms; and, therefore, the value of any method of wound-treatment depends primarily on the degree of antisepsis which can be obtained by it.”

The next chapter deals with the application and management of the various forms and varieties of dressings and after-treatment. Lister's antiseptic dressing receives an unqualified endorsement, as would naturally be expected, in view of the author's strong predilection for that method, founded on his personal experience and study. Guerin's cotton wadding, O'Halloran's open method, Callender's and Markoe's modified antiseptic, Gamgee's dry and infrequent dressings, Hewson's earth treatment, and water dressings, receive appropriate consideration and illustration. One searches in vain for any mention of corrosive sublimate or of iodoform, or of any dressing material other than carbolic gauze and cotton-wool, except the earth used by Hewson. This chapter shows no evidence of any knowledge by the author of the advance in wound treatment which the last five years have witnessed. All his references are to publications and experiences that have already been forgotten in the throng of newer and more exact knowledge that has since accumulated. This chapter bears internal evidence of having been written some years ago, and of having been incorporated in the book without revision.

In chapter VIII., after briefly describing the varieties of, and the changes in stumps, the author enters upon the subject of artificial limbs, "which," he says, "has not in England or America received that attention to which it is entitled from the medical profession. The works on surgery in the English language are singularly deficient in this respect, containing only a few meagre facts, wholly insufficient to prepare the surgeon to make an intelligent selection of an artificial limb for a patient, or even to study the advantages and disadvantages of a particular kind of stump, with reference to prosthesis." This very valuable part is, in the main, adapted from French sources.

The last three chapters of the book treat of the various complications of wounds. Shock, hemorrhage and traumatic fever, pyæmia and septicæmia, and septic wound accidents are freely and fully written about. The author's original investigations into the etiology of non-septic traumatic fever can hardly be said to have settled this moot point, although making an important contribution, by exclusion, to our stock of knowledge on the subject. The remarks upon gangrene are thorough and well considered. The article on osteomyelitis is illustrated by an excellent colored plate. The proof-reader is responsible for many typographical errors disseminated throughout the volume. As a whole, this "encyclopedia monograph" is worthy of praise as a useful and adequate compendium of facts and theories relating to amputations.

G. R. BUTLER.



# ASTRAGALOID OSTEOTOMY IN THE TREATMENT OF FLAT-FOOT.

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FOR some time it has been a matter of doubt to me as to whether the generally held theories as to the ætiology of pes planus or flat-foot were such as should be unhesitatingly accepted. These have been two-fold—one based on an alleged relaxation of certain ligamentous structures, notably the calcaneo-scaphoid ligament; and the other that it is largely, in some cases entirely, due to a paralytic condition of certain muscles connected with the ankle and foot, more especially the tibialis anticus.

My doubts as regards the value to be placed on the first of these theories have arisen mainly from there having been up to this no satisfactory demonstration of the existence of ligamentous relaxation; from observing that in a large proportion of the cases that have fallen under my observation the deformity occurred, not in delicate, weakly, anæmic subjects, but in young persons who were strong, healthy, and well nourished; and from noticing how uniformly unsuccessful the attempts are to permanently remedy the deformity by any of the routine lines of practice, such as pushing up the arch of the foot and keeping it in that position by any of the various mechanical adjustments designed for this purpose.

In these cases, too, there has been an entire absence of any evidence of local paralysis.

These facts have naturally shaken my belief in the views as to the ætiology of the conditions which are usually taught, accepted, and acted on by surgeons.

However, not having until recently an opportunity of either verifying or disproving these doctrines by means either of dissection, or inspection in pathological museums of examples of the deformity—for, strange to say, although it is a defect of such common occurrence, the pathological museums are singularly deficient in examples of it—I consequently was unable to arrive at any definite conclusion as to what should or should not be accepted as regards the causation and pathology of the deformity.

My attention was, comparatively recently, directed again to the subject on reading Professor Ogston's paper on flat-foot—one written with that ability and originality which characterise his contributions and make them so grateful to the surgical student.

In this communication he advocates a complete revolution in the previously accepted methods of dealing with the deformity—viz., cutting down on the astragalo-scaphoid articulation, removing a thin slice from the surfaces of these bones where they articulate with each other, restoring the arch of the foot, and fixing the two bones together with fine ivory pegs, which are left in the wound. This procedure has been attended, it is stated, with eminently satisfactory results. There are, however, two features in it which appear to me to detract somewhat from its merit—one, that the operation is so complicated and difficult; and another, and more important, is that one of the articulations in the tarsus is necessarily completely obliterated, an object of the operation being to get, after reducing the deformity, anchylosis of the astragalo-scaphoid joint.

Before discussing the method of operation adopted in the case I desire to record, I may previously advert to the views already alluded to in reference to the ætiology of the defect. As regards the opinion emphasised by Professor Sayre, and, I am informed, endorsed by Mr. Barwell in reference to a paralytic condition of certain muscles, notably the *tibialis anticus*, I would say that, without denying the possibility in certain cases of this condition aiding in, or being the cause of the production of the deformity, it must, I think, be very rarely a determining factor. I have never satisfied myself of its exist-

ence in any of the cases that have come under my notice, and I observe in Mr. Symington's excellent paper on flat-foot in the October number of the *Journal of Anatomy and Physiology* that Mr. Golding Bird failed to find it in any of his cases, which were fifty in number, although he always looked for it.

A twofold cause is mentioned by the late Professor Hueter (*Grundriss Chirurgie*)—one a hyperpronation of the foot in infancy when, namely, the child begins to walk, coupled with and possibly caused by ligamentous relaxation. This latter view is combated by von Meyer, who denies the relaxation of the calcaneo-scaphoid ligament, and attributes the deformity to a displacement of the astragalus due to an excess of its natural movements. Whether this opinion is founded on *post-mortem* examination or is merely the result of theoretic speculation I am unable to say. But whether it is or not, due weight must be attached to his opinion on the subject.

In the debate which took place last August at the International Medical Congress at Copenhagen on talipes and its treatment, the opinions of several authorities were distinctly in favor of the view—contrary to what is generally held and taught—that to original osseous malformation, rather than to muscular or ligamentous abnormality, must we look for explanation of these deformities. The opinion I then expressed was strongly opposed to this view, but I am free to admit that from what I then heard and have since ascertained, I should not, were the discussion to take place again, express myself quite so decidedly as I did.

If the original malformation theory holds good of the ordinary forms of talipes it should do so equally of pes planus, and a study of Mr. Symington's case tends greatly to strengthen this view. The signal failure that so frequently attends the mechanical treatment adopted in these cases also does so, as well as the inspection of the specimen which, through the kindness of our President, I am able to lay before the meeting.

It was, in truth, with feelings of no ordinary satisfaction that I obtained the opportunity of inspecting this singularly interesting specimen just alluded to—the only one of the kind, so far as I am aware, in this country, and which verifies to so

great an extent the views I have held so long as to the ætiology of the defect. Professor Cunningham, too, who has carefully examined this specimen, agrees with me in the propriety of dismissing the idea that ligamentous relaxation would alone account for the changes here present, and the same remark may be made in reference to paralysis being an ætiological factor. The principal osseous abnormalities are those observed in the astragalus and os calcis. In the former of these it may be observed that the head of the bone is directed downwards instead of forwards, and its articular surface in contact, not with the scaphoid, but inferior calcaneo-scaphoid ligament; that on the upper and now anterior portion of the neck of the bone is an abnormal facet articulating with a somewhat hypertrophied scaphoid; that the distance between the posterior margin of the scaphoid and anterior edge of sustentaculum tali is nearly double what it is in the normal condition of things; that the sustentaculum tali, instead of forming a nearly horizontal base of support for the astragalus head, is directed obliquely downwards and forwards, the groove immediately posterior to it, as pointed out to me by Professor Cunningham, looking backwards instead of downwards. The head of the astragalus is enlarged, and the neck of the bone is lengthened on its upper or now anterior surface, whereas posteriorly its length is normal or nearly so. The body of the bone is apparently unaltered, its trochlear surface maintaining its normal relations.

If the views of von Meyer and those who think with him were correct, that, namely, the deformity is due to displacement of the astragalus forwards and inwards, the body of the bone should partake of the displacement as well as the neck and head, the trochlear surface should be directed forwards, and a new articular facet formed, or an extension of the normal one backwards.

The interosseous ligament is evidently the means of keeping the body of the bone in its position and relieving the calcaneo-scaphoid ligament of pressure. That it did so in this case is obvious, inasmuch as its upper articular surface preserves its normal relations.

The changes in the position of the bone indicated by von Meyer are in this case non-existent.

My contention, therefore, is that we must look to something else besides relaxed ligaments and paralysed muscles as causing these remarkable changes, though I do not, of course, deny that they may not at times be present.

Having regard to the osseous deformities in this remarkable case, as well as the very similar state of things found in Mr. Symington's, it is not surprising that the routine line of practice already alluded to should, as a rule, prove so ineffective. This is especially obvious in those instances constituting, I believe, the majority of those cases in which there is, as may be here observed, an abnormal projecting angle or ridge separating the articular surface into two portions—one articulating with the scaphoid, and the other with the inferior calcaneo-scaphoid ligament. This projecting ridge forms an effectual barrier in preventing a restoration of the arch by any pressure made from without.

CASE.—In April, 1884, a youth *æt.* 14 years, came under my care in the Richmond Hospital, in one of whose feet all the physical characters of flat-foot were well marked. He was a well-nourished, strongly-built, fresh-complexioned lad, whose health generally had always been excellent. He complained greatly of pain in the foot, especially about the medio-tarsal joint, after walking for a short distance or standing for even a very limited time, and consequently he was unable, as his relatives stated, to take sufficient exercise or join in the recreations of his companions. The case appeared to me to be in every way suitable for operative interference, the condition of things causing much trouble to the patient, and the case being one in which the arch of the foot could not be restored by any reasonable force or pressure from without. In order to render the parts to be operated on as perfectly aseptic as possible, for several days a process similar to that recommended by Professor Ogston, of frequent washing with a (1—20) solution of carbolic acid, rubbing off all superfluous epidermis, and keeping the foot day and night carefully wrapped in several layers of moistened carbolised gauze, and applying immediately before the operation spirits of turpentine, was used. I made an incision (under a carbolic spray strongly directed on the part) an inch and a half in length along the inner edge of the foot, the centre of which incision was the prominence caused by the head of the astragalus, though of this, I confess, I was not quite certain, until I exposed it, as to whether, namely, the tumor was formed by the head of the astragalus or tuberosity of the scaphoid. In some cases I have little doubt it is caused by the latter.

At the centre of the incision I made along the inner edge of the foot I made another three-quarters of an inch in length, and at right angles to the first, and a little behind the situation of Chopart's joint, and dissected back the two small triangular flaps of skin for about half an inch. My object was, if possible, not to open the joint, but to remove a wedge-shaped piece of the enlarged head of the astragalus, which wedge should have its base below an apex above, and which, if removed, would enable the depressed portion of the tarsus to be elevated and the arch restored. On taking out the wedge, which I did with an osteotome, I found that it was impossible to avoid implicating Chopart's joint, and accordingly a portion of bone was removed, which included a part of the abnormal facet which articulated with the scaphoid. I found then that by adducting and supinating the foot the arch was perfectly restored. Listerian dressings were then applied, but without drainage. In the healing of the wound there was no pus production, and the patient was afebrile throughout. On the wound being healed, the method I adopted for keeping the foot in a position of adduction was a simple one, and one to be recommended in these cases—namely, the application of a Dupuytren's splint applied as in a case of Pott's fracture of the fibula. In this case it was kept on for a fortnight, when a gypsum bandage was substituted for it. The result was most satisfactory, and an examination of the case, made in the sixth month after the operation, was such as to make me look forward with confidence to the good result being permanent, the patient informing me—and his statement was endorsed by his friends—that he was able to walk, run, and play about as well as any other healthy boy of his own age.

From the foregoing remarks the following propositions may be considered :—

1. That the theory of ligamentous relaxation being the chief factor in the production of flat-foot is erroneous, being in the majority of cases the result and not the cause of that deformity.
2. That elongation of the calcaneo-scaphoid ligament should not be mistaken, as it so often is, for relaxation of it.
3. That the altered direction of the sustentaculum tali is a change that could not be directly or indirectly connected with either ligamentous relaxation or muscular paralysis.
4. That the osseous deformation, whether resulting from original malformation, or rickets, or other pathological change in genu valgum—a condition until quite recently believed to

depend solely on ligamentous relaxation—furnishes an *à priori* argument in favor of the author's theory.

5. That the treatment of pes planus in cases, at all events, where the deformity is irreducible should be directed mainly to restoring the arch of the foot by operative interference with the misshapen astragalus.

6. That this is feasible without destruction of the mediotarsal joint.

7. That the evidence in favor of muscular paralysis being an ætiological movement in the production of flat-foot is insufficient and unsatisfactory.

8. That deformity of the scaphoid, the result of disease, may also be looked upon as a cause of flat-foot.

9. That the appearances in the specimens noted by Mr. Symington and the author furnish strong proof of the truth of the connexion between flat-foot and original osseous malformation.

10. That after astragaloid osteotomy it is desirable to keep the foot, during the healing of the wound, in a state of supination, which can be conveniently effected by the application of a Dupuytren's splint, as used in fractured fibula.

OBSERVATIONS UPON THE SURGICAL ANATOMY  
OF THE KIDNEYS, WITH SPECIAL REFER-  
ENCE TO THE TWELFTH RIB, THE PLEURA  
AND THE DIAPHRAGM, AND THE  
QUESTION OF EXPLORATORY IN-  
CISIONS INTO THE PELVIS OF  
THE KIDNEY.<sup>1</sup>

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IN the summer of 1882 I had, through the kindness of Professor Braune, of Leipzig, the opportunity of investigating the lumbar region about the kidneys, and I did that from two points of view: First, I wanted to ascertain the lower boundary of the pleura and its relations to the last rib and the diaphragm, and second, I intended to find out the most easy and favorable way by which we might get at the pelvis of the kidneys. I am sorry to say, that neither time nor material were at my disposal to such an extent, that to either of the above questions I can offer an exhaustive elaboration, still I hope that my investigations may offer some of the interest they have given to me, and that so much more, since we have to deal with an anatomical region, which lately, more than ever, has attracted the attention and called forth the skill of the surgical world.

<sup>1</sup> This paper in its essential parts was read before the New York Surgical Society more than two years ago. I then had the intention to follow up this subject and to give it a more complete elaboration before publishing it. Want of time has so far prevented me from doing so, and I doubt whether, under the pressure of practical work in America, I shall ever find the opportunity. Perhaps others, who are working under more favorable conditions, might be induced to bring some of the questions treated in this paper to a more complete and satisfactory conclusion.



You are aware that the late Professor Dumreicher, of Vienna, had the misfortune to open the pleural cavity during an attempt to remove a pyonephrotic calculous kidney. At the autopsy it was found that the last rib was rudimentary, that the pleura projected beyond its lateral end and a good deal below the lower edge of the eleventh rib, which had been taken for the twelfth, and that in elongating the incision toward the point last mentioned, the unlucky accident was unavoidable. Still this accident had one good result, in that it gave birth to the investigations made by Dr. Holl, of Vienna, about the frequency of rudimentary development of the last rib, and about the relation of pleura and diaphragm in such cases. Dr. Holl found that in quite a considerable percentage the last rib is abnormally short, so that it does not reach as far as the border of the musculus sacrolumbalis, or so rudimentary that in some cases it is more similar to an articulatory process transversus; that, however, the insertion of pleura and diaphragm are not different from the normal anatomical relations on these same cases, the lower edge of the pleura going from the lower boundary of the last dorsal vertebra in almost horizontal direction toward the lower edge of the eleventh rib in the way explained in this sketch. He therefore very justly recommended, in order to avoid danger resulting from such anatomical relations, always to count the ribs before intended nephrectomy. His investigations do not, however, give us the certainty, whether normal development of the last rib, at all events, gives us a guaranty that lesions of the pleura in lumbar incisions are out of question.

A glance at this very rough sketch, Fig. 1, made in the dissecting room, will convince you that exceptionally even normal development of the last rib demands extreme caution. You see here the twelfth rib developed rather well, the diaphragm (*bb*), proceeding from the upper edge of the transverse process of the first lumbar vertebra horizontally, and reaching the rib at a point several centimetres beyond the lateral border of the quadratus lumborum (*d*.) About one-third of a centimetre above the lower edge of the diaphragm the pleura commences (*ff*), and you see to what an extent it projects beyond the lower edge of the twelfth rib. It is covered by a thin fascia,

which has been removed except in this area, where it is thickened after the manner of a ligament (*g*), which runs from the transverse process of the first lumbar vertebra, in oblique upward direction, toward the border of the last rib. An incision along the lateral edge of the quadratus lumborum, which

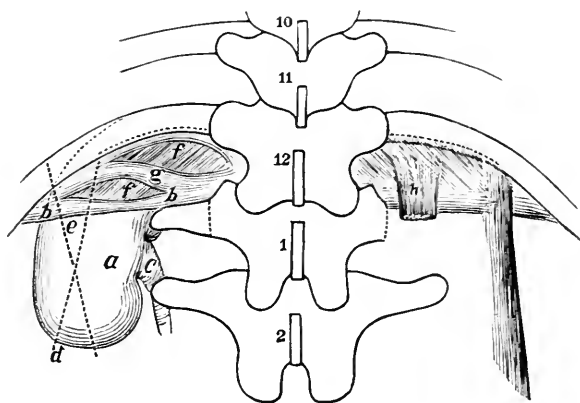


FIG. 1. EXCEPTIONAL RELATIONS OF TWELFTH RIB, PLEURA AND DIAPHRAGM (*from nature*).

*a*, kidney; *bb*, lower edge of diaphragm; *c*, pelvis of kidney; *d*, lower edge of quadratus lumborum; *e*, outer edge of sacrolumbalis; *ff*, pleura; *g*, thickened portion of fascia covering pleura; *h*, slip of quadratus lumborum inserted into fascia covering pleura.

is indicated by the dotted line (*d*), would have been very dangerous in this case; and the incision in the line of the sacrolumbalis (*e*) would not yet have been entirely out of danger, though much less dangerous than the former.

In the right side of the same body I found the following interesting abnormality: After the transverse process of the first lower vertebra, which in this case had movable articulation with the vertebra, had been removed, and the quadratus lumborum separated from its upper attachment to the twelfth rib, it was found that a small bundle of its fibres made its insertion at the pleura, or rather at the thin fascia which covers the pleura and is in somewhat intimate connection with it, Fig. 1 (*h*). In other respects the anatomical relations were identical to those on the other side.

Again, this second sketch, Fig. 2, equally rough with the other, is still apt to prove that not in all instances of rudimentary development of the last rib, is the pleura likely to come within the scope of danger.

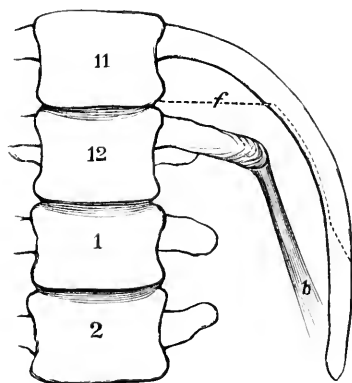


FIG. 2. RELATION OF PLEURA TO RUDIMENTARY TWELFTH RIB  
(*from nature*).

*b*, ligamentous prolongation of rudimentary twelfth rib; *f*, dotted line indicating lower edge of pleura.

You see here the lower boundary of the pleura (*f*) passing from the lower edge of the eleventh dorsal vertebra, at a good distance above the last rib, horizontally toward the eleventh rib, so that the twelfth, which is only four centimetres long, might almost entirely protect the pleura against being incised from below. The quadratus lumborum in this case had its main insertion on the twelfth rib; a portion of its fibre, however, proceeded to the lower edge of the eleventh, and its lateral border allows a minute angle of the pleura to project laterally.

The diaphragm showed an enormous gap, and the muscle-fibres were absent from the arcus Halleri internus above the upper part of the psoas as far as the extreme one-fourth of the eleventh rib. Between these two points the fibres of the diaphragm communicated in a high arch, bounding an area within which the fatty tissue about the kidney was in direct con-

tact with the pleura. In a case like this the progress of an inflammatory process from the perinephritic tissue to the pleura, and vice versa, might find a very favorable anatomical predisposition.

Before I proceed to the second part of my paper, let us reconsider the normal position of the kidneys. Allow me to show these two sketches, Figs. 3 and 4, representing horizontal sections through the body of a well-developed male, whose blood-vessels had been injected. The upper section is made through the first lumbar vertebra immediately below its junction with the last dorsal. Imagine yourself looking upon the surface of the lower section. Let us bear in mind that the upper end of the kidneys are nearer to the spinal column than the lower ones; that the hilus is directed rather forward (according to Luschka, the elongated axes through the hilus cut each other at an angle of about  $60^\circ$  before the middle of the first lower vertebra), and that, as a rule, the left kidney reaches somewhat higher than the right one. According to Luschka the upper edges of the kidneys correspond about to the middle of the eleventh dorsal vertebra, while Braune and others assume the upper boundary of the twelfth to be the average height. The latter author emphasizes that the position of the kidneys under the liver and spleen respectively renders it probable that enlargements or dislocations of said organs must influence the position of the kidneys, and he proves that from an analysis of some of the plates of Pirogoff's *Atlas of Topographical Anatomy*, where enlarged liver and spleen have dislocated the kidneys so far that the hilus, which is generally met with at the height of the first lumbar vertebra, corresponds about to the fourth; and from another plate, illustrating a pleuritic exudation in the right pleural cavity, where no part of the kidney is met with at the height of the middle of the twelfth dorsal vertebra. You remember also that, as a rule, the location of the hilus of the kidneys is such that it does not correspond to the middle of the anterior edge, but more to the front part of the posterior surface, the way it is presented in this sketch.

In order to ascertain whether respiratory movements might modify the position of the kidneys, the following experiments were made :

I. Cadaver of a well-nourished male of about 35 years of age, lying in prone position. Both kidneys are laid bare by long lumbar incisions reaching upon the posterior surface of what seemed to be the last rib. Later examination showed that in fact it was the eleventh, while the twelfth was so short that it did not reach the lateral border of the quadratus lumborum. An incision along the latter muscle would have, in this case, surely opened the pleural cavity, the border of which is even below the apex of the twelfth rib. From here it passes in an oblique downward direction toward the eleventh.

The lungs are insufflated and it is clearly observed that both kidneys move downward, the right one about two, the left about one and a quarter centimetres. At the same time they are slightly pushed backward. During and after expiration the kidneys slowly return to their former position. The cadaver is then raised and suspended so that it stands upright on its feet. In this procedure both kidneys sink downward very distinctly, the right one almost four and the left more than two centimetres, at the same time they approach toward the anterior abdominal wall. Repeated insufflation causes, as the most striking change, a backward dislocation. The posterior convex edge is approaching about one centimetre. The downward dislocation is very insignificant.

The cadaver is already in an early stage of decomposition.

II. The cadaver of a strong, vigorous man of about 25 to 30 years of age; well preserved. Lower extremities still in a state of rigor mortis.

Lumbar incision along the border of the sacro-lumbalis. Twelfth rib well developed; the lateral end standing about as high as the transverse process of the third lumbar vertebra in the posterior axillary line. Belly posture. Insufflation: The kidneys descend about one and half centimetres, at the same time they are slightly dislocated backward and in lateral direction. During expiration they slowly return almost to their former position. The trachea is then closed hermetically and the cadaver brought into upright posture. Both kidneys sink about two and a half centimetres downward and to the same extent forward. Then the trachea is opened; the kidneys sink still more, approach to the posterior surface of the body and turn around their longitudinal axis so that the hilus becomes directed more forward. Insufflation causes both kidneys to descend, the right about two, the left about one and a half centimetres. The lower sinus of the pleura, which now reaches as far as the lower boundary of the processus transversus of the first lumbar vertebra, is tightly filled with insufflated

lung and pushed somewhat downward together with the diaphragm. This relation becoming evident after removal of the upper part at the quadratus lumborum. Possibly during life the lung does not come down as far as this. Henle and others at least think so. Assuming, however, such a far-going inspiration possible, than in our case lumbar incision along the border of the quadratus lumborum would have been dangerous only at the height of such an inspiration, while during expiration the pleura and diaphragm come less in question. The border of the vertebral portion of the diaphragm is, on the left side, distinctly higher than on the right. On both sides it corresponds about to the lower border of the transverse process of the first lumbar vertebra; on the right side slightly deeper.

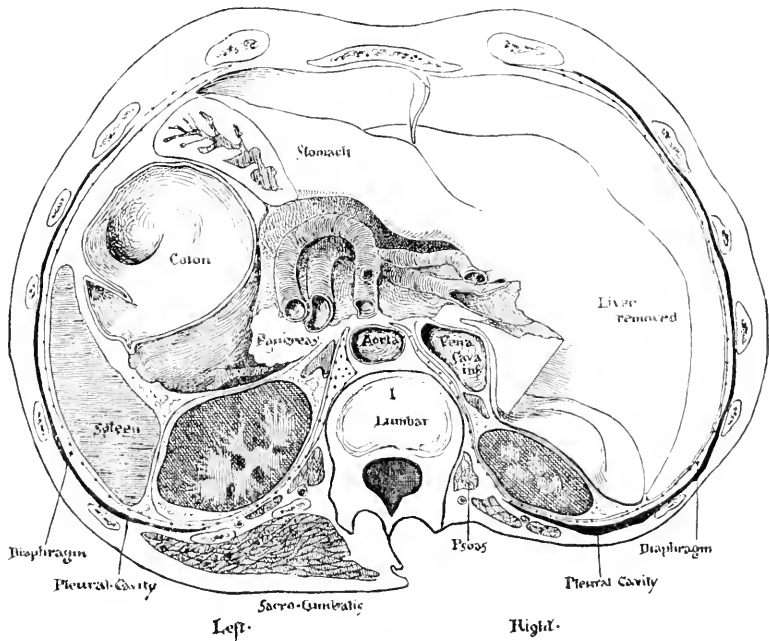


FIG. 3. HORIZONTAL SECTION OF BODY THROUGH FIRST LUMBAR VERTEBRA (*surface of lower section*).

It remains to be added that in the above experiments rather forced inspiration was used, and I am far from drawing any absolute conclusions therefrom. It seems, however, probable that strong respiratory movements may, from the organs lying

above the kidneys, cause slight movements of the latter in the living person, and that especially upright posture might give to these organs a decidedly lower position than that which we find in the cadaver, the latter, as a rule, representing the state of extreme expiration. Thus this transverse section showed the kidneys in their highest anatomical location. That considered, now let us further analyze it.<sup>1</sup> See Fig. 3.

In this instance the left kidney is considerably higher than the right one, of which the uppermost part only has been cut off. Immediately around both kidneys we find the adipose capsules well developed along the anterior and posterior edges, while on the right side it almost does not exist at all along the anterior surface, which is tightly covered by peritoneum, and almost to its whole extent is in contact with the posterior and lower surface of the liver. From the *psoas* and *quadratus lumborum* it is separated by the diaphragm, which you see indicated by the dotted line, and behind the diaphragm you see the pleural cavity. You see distinctly how it reaches beyond the lower edge of the twelfth rib, which here, on account of the oblique downward direction of the rib, is at the same time the internal. Corresponding to the lateral edge of the kidney the space is about two and a half centimetres deep, and further on the highest point of lateral convexity of the thoracic wall about six centimetres. That is about the ninth intercostal space. On the left side the pleura commences more laterally and does not reach beyond the middle of the twelfth rib, while the depth of its cavity could not be ascertained in consequence of old pleuritic adhesions. At this point, which indicates the lateral end of the *ligamentum coronarium hepatis*, the peritoneum leaves the lower, or rather anterior surface of the diaphragm and gradually rises upon the anterior surface of the kidney. On the left side it ceases suddenly at the posterior edge of the spleen, the latter organ leaning with the posterior half of its inner surface, which here is not covered by peritoneum, toward the left kidney.

I now beg to call your attention to this transverse section, (Fig.

<sup>1</sup>I have since observed respiratory movement of kidneys in the living subject, (cf. lower down.)

4,) which is carried almost two vertebræ below the first, just between the second and third lumbar vertebræ. The surface of the upper segment as seen from below is shown in the drawing. You see here, also, what was less evident in the former plate, that the left kidney is somewhat more directed in front, and corresponding to that its anterior edge comes more forward than that of the right one. The last rib has ended about one centimetre above this level, corresponding exactly to the greatest convexity of the posterior edges of the kidneys. You see the comparatively long distance from the border of the quadratus lumborum, which at this level, on the right side, almost coincides with

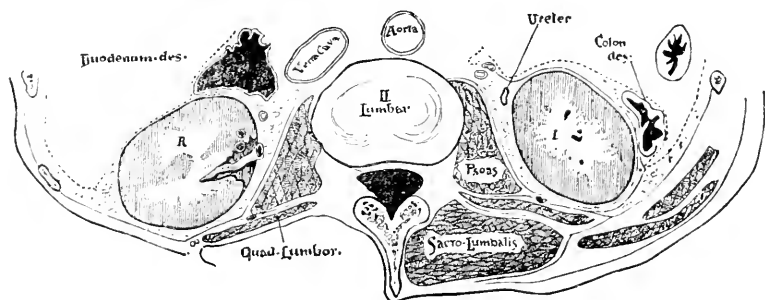


FIG. 4. HORIZONTAL SECTION OF BODY BETWEEN SECOND AND THIRD LUMBAR VERTEBRÆ (*surface of upper section*).

*R*, right kidney; *L*, left kidney.

that of the sacrolumbalis) to the extreme point of the peritoneum parietale. You see, also, that on the left this distance is at least one centimetre smaller than on the right. A still greater difference exists between the distance from the border of the quadratus to the ureter and the pelvis; only that of the right kidney falls within the niveau of this section, and that immediately near its lowest point. A thin part of renal tissue had to be taken away in order to expose the pelvis within the hilus. From the border of the quadratus lumborum to the ureter we measure four centimetres on the right to six on the left side; and though here the pelvis, which shall be met one and a half centimetres above, might be located slightly more laterally, still that cannot be so much as to account for this great difference.



Under all circumstances it is evident from these plates, that if we intend to proceed toward the pelvis of the kidney for surgical purposes, we have to advance along the posterior surface of the organ in all those cases where the anatomical condition of parts approaches nearer the normal. We will not have to contend either with the peritoneum or the viscera lying in front of the kidneys, or last, not least, with the vessels of the kidneys which, as a rule, are situated in front, and slightly above the pelvis.

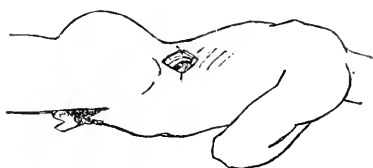


FIG. 5. OPERATION FOR EXPOSING PELVIS OF KIDNEY.

Outline to show Field of Operation.

pression that heretofore the most favorable plan for proceeding toward the pelvis and exposing it clearly to the touch and sight has not been followed. These illustrations, Figs. 5, 6, 7 and 8, represent different stages of the operation in the way I performed it on the cadaver. The position is the prone one, with slight inclination toward the side of the operation. An incision is carried along the border of the sacrolumbalis. The twelfth rib must be ascertained by counting, and its length by the touch. The border of the quadratus lumborum must be exposed. We do

In reality the number of cases is probably very small in which incisions into the pelvis for the purpose of removing stone is feasible, and it is of considerable value to find a method by which probatory incisions into the pelvis can be done with as much ease and safety as possible. I am under the im-

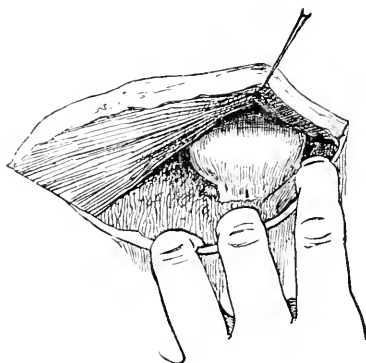


FIG. 6. PROTUSION OF LOWER END OF KIDNEY INTO OPERATION-WOUND.

(Fat Subject).

that very cautiously near its insertion on the eleventh rib. You must remember, the higher up you go and the deeper the cut, that the pleura sometimes, even under otherwise normal conditions, reaches beyond the lateral border of the quadratus lumborum, and I would advise under no circumstances to proceed in the deeper parts beyond that line which is given by the appearance of the last intercostal nerve. This coincides usually with the lower edge of the diaphragm, provided there be no gap in the same as hinted at before. As soon as that thin fascia is dissected which surrounds the adipose capsule of the kidney, the latter protrudes into the wound, a condition of things that you see illustrated in this drawing, Fig. 6, taken after nature. Of course only the lower third of the kidney makes itself visible. It might be necessary, in fat persons, to

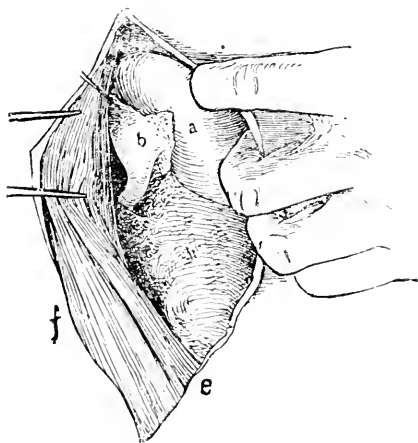


FIG. 7. SAME AS NO. 6.

Plevis and Ureter exposed by further removal of Perinephritic Fat.

*a*, kidney; *b*, pelvis of kidney; *e* *f*, quadratus lumborum.

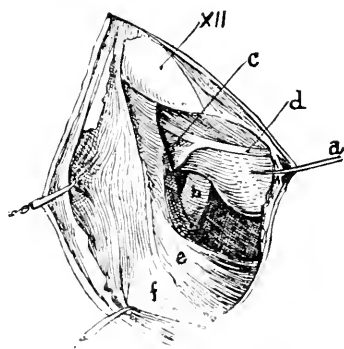


FIG. 8. EXPOSURE OF LIVER END OF KIDNEY AND ADJACENT STRUCTURES IN AN EMACIATED SUBJECT.

*a*, kidney; *b*, ureter; *c*, diaphragm; *d*, last intercostal nerve; *e*, quadratus lumborum drawn aside; *f*, sacro-lumbalis.

remove some of the adipose tissue on the posterior side; then the organ must be dislocated in lateral direction, the fat has to be pulled away from the posterior aspect of the pelvis, and the latter and the ureter then can be easily exposed to the extent you see it represented in this sketch, Fig. 7.

In a body like this, Fig. 8 which was emaciated to the utmost degree, and in which not the slightest particle of fat existed any more, the operation was a perfectly easy one. In stout and fat individuals a great deal of difficulty might occur owing to the depth at which the operation has to be performed. The amount of fat impedes clear view and perfect isolation of the pelvis of the kidney, and perhaps hæmorrhage might become troublesome.

I will not forget to mention that in several instances I encountered a rather thick venous branch emerging from below, behind the lateral border of the pelvis and of the ureter and entering into a thick branch of the kidney vein, which abnormally took its origin from the renal substances in a level behind the pelvis. The branch coming from below, which I have found on both sides, was perhaps a spermatic vein. The cadavers were not so far at my disposal to decide this question. Probably it would be necessary in such a case to secure that vessel by double ligature.

Since the above was read I have had several times the opportunity to observe, in living persons, on whom colotomy had been performed, that in fact the position of the left kidney is influenced by respiration in the above sense, and that in the horizontal posture its descent during inspiration is quite marked, while in the upright posture it sinks downward and presents hardly any change of its position during respiration. I have also had the opportunity to practice a probatory incision into the pelvis of the left kidney, and in following the rules which I laid down according to my investigations on the cadaver, I was struck with the comparative ease and accuracy with which that operation can then be performed. The patient was an inmate of the German Hospital, aged about 45 years, who for years already had suffered from urinary disorder. In short I deemed it advisable to ascertain whether a pyelitis, which undoubtedly existed, was complicated by the presence of stone. Though the man had skoliosis, and the space between the left last rib and the crest of the ilium was so narrow that two assistants had to exert force on the upper and lower end of the trunk in order to somewhat straighten the vertebral column during the operation, the access to the pelvis of the kidney

was comparatively easy. I was perfectly able to see and feel to make probatory puncture and incision into the pelvis and explore it with my finger; to insert a soft bougie and pass it down into the bladder. During inspiration the kidney descended about two centimetres. In order to dislocate its lower end laterally I should recommend to insert an armed sponge-holder on its lower end and to exert by means of that a slight pressure against the renal tissue. Any metal instrument inserted on the border or into the substance of the kidney, is apt to cause rupture of the same.

The patient just mentioned has since died—about fourteen days after the operation—under the symptoms of uræmia. He was much run down at the time of the operation, and was certainly no favorable subject for an operation. His wound had done well all the time, and never did he present any considerable rise of temperature. Nay, the direct discharge of pus from the pelvis of the kidney seemed to benefit him, inasmuch as the pain diminished and his urine became distinctly clearer. The autopsy showed that both kidneys were in an advanced stage of pyelonephritis, but only on the left one, about which great pain was located, a number of very small abscesses were present.

## CASES BEARING UPON CERTAIN MOOTED POINTS IN SYPHILOLOGY.<sup>1</sup>

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### THE EXCISION OF SYPHILITIC CHANCRE.

CASE I. In 1884, a medical gentleman from a neighboring State called at my office to show me a small pimple situated upon the middle portion of the integument of the dorsum of the penis. This lesion was an acuminate papule, not capped by a pustule. The epidermis was unbroken. The color was slightly livid, the size about  $\frac{3}{16}$  of an inch at the base. There was no appreciable induration. Indeed, the lesion had no pronounced specific character. It was not painful. There was no inguinal glandular engorgement. The lesion had appeared during the afternoon of the day before I saw it. It was less than twenty-four hours old, and the patient ascribed it to suspicious sexual contact dating back two weeks. The integument of the penis and the rest of the body was normal, the general health good.

A diagnosis was impossible, although the general appearance of the lesion suggested an accidental papule, and would have justified a favorable prognosis as to syphilis. Yet the patient was solicitous that something should be done.

Cocaine as a local anæsthetic was just coming into use, and I proposed to him excision with the aid of this agent. He gladly accepted the test. I washed the unbroken surface with a powerful solution of bichloride of mercury, one in two and a half, dried it, injected 5 m of a 4% solution of cocaine, caught up the little papule, with a full margin of the ample soft integument around, and with scissors curved on the flat excised an abundant fold, including the lesion and considerable healthy tissue around. Two catgut ligatures upon bleeding veins and

<sup>1</sup> Read before the New York Surgical Society, April 14, 1885.

three catgut sutures promptly finished the operation and left the wound absolutely dry. The patient had not experienced a particle of pain. On his return home the doctor visited the suspected person, and found that she had a syphilitic eruption.

The wound healed promptly by first intention. On the sixty-second day, after three or four days of premonitory fever, no medicine having been taken, the patient observed a mild roseola, which promptly disappeared. Fourteen days later he visited me. He had lost eight pounds in weight. In one groin were two indolent indurated glands, and there was one in the other groin. The site of the excised chancre was soft and perfectly well, showing only a faint linear white scar. There was intense rheumatism, worse at night. There were scabs in the scalp, and the hair was falling. A profuse general papular syphilide covered the entire trunk, the face and both the palms. Mucous patches abounded in the mouth. The eruption was brilliant and abundant; the patient pallid.

The disease had not been interfered with by any medical treatment, and was a plain instance of a sharp attack of syphilis which had not seemingly been in any degree modified by the excision of the initial lesion, although executed under unusually favorable circumstances.

This case I consider worthy of record because it fulfills the most exacting conditions for testing the question, still under consideration in the profession, as to whether syphilis is or is not already a constitutional disease when the chancre appears.

I do not care to tabulate statistics of the excisions practiced by various operators. The *résumé* of Dr. Morrow,<sup>1</sup> in December, 1882, covered enough cases to allow generalization, and nothing which I have seen since that date has modified the conclusion he seemed justified in drawing—namely, that the excision of chancre does not attenuate the poison of syphilis or modify the general symptoms.

Berkeley Hill's case,<sup>2</sup> it appears to me, carries more weight than any other reported before or since. A man tore his frænum during intercourse at 4 A.M. At 3:30 P.M. on the same day—less than twelve hours after the exposure—Hill destroyed the entire raw surface with fuming nitric acid. An eschar separated, and the wound healed. A month later the cicatrix indurated and general syphilis followed.

<sup>1</sup> *Journal of Cutaneous and Venereal Diseases.*

<sup>2</sup> *Syphilis and Local Contagious Disorders*, Hill & Cooper, 1881, p. 76.

My own opinion has been strongly opposed to the belief that local excision of chancre would prevent or modify general syphilis. I have offered the treatment to many, but, as I never felt conscientiously at liberty to promise any advantage as a result of the operation, my proposition has been declined. I would not have operated in this case except to test the cocaine, and because the patient, being a physician, earnestly desired it.

My case is quite analogous in its history and result to one reported by Dr. R. W. Taylor,<sup>1</sup> where a papule was excised upon the day on which it appeared, with no advantage to the patient, whose general symptoms came out in two weeks. It is on a par with others where early excision was practiced in vain (Mauriac—forty-eight hours).<sup>2</sup>

I have recently encountered another case in point (unpublished):

CASE II. X, æt. 37 years, came to me in January, 1885, stating that in November, 1883, he noticed a small chancre on the penis. This was excised on the first day, and the wound promptly healed. In six weeks he had a general roseola. He is now in his second year, having had numerous eruptions, and been plentifully treated in various ways, including 45-grain doses of the iodide of potassium three times a day, and a course of eight weeks at the Hot Springs, during which time 10  $\frac{3}{4}$  of blue ointment were rubbed into him. He came to me for some small gummatous tubercles upon the face, and is still under treatment. In this instance surely the excision did not formally modify the intensity of the disease.

A medical friend, who wishes to be nameless, has recently reported to me a case of excision within twenty-four hours of the appearance of the lesion, in which general symptoms (roseola) appeared upon the thirty-second day. In other words, it has not been my good fortune to meet with any case where excision was practiced with a favorable result.

I think it not difficult to understand how apparent success may follow excision when we remember the multiple sources of possible error in diagnosis; and particularly is this the case

<sup>1</sup> *Veneral Diseases*, 1883, p. 510.

<sup>2</sup> *Ann. de dermat. et de syph.*, July, 1881, p. 523.

in Germany, where the best results are alleged (30 to 50%), for there the advocates of excision are all unicists (notably Auspitz and Kaposi), and are doing their best to return all primary venereal sores into that chaos from which Bassereau and the French school have endeavored to deliver them.

The sources of error to which I refer are :

1. Inflammatory induration of lesions not syphilitic.
2. The small ulcerated gumma of the penis.
3. Non-specific sores which resemble the infecting chancre.
4. Cases of delayed syphilis.

I need not cite instances of the first two classes mentioned above. We are all familiar with the local sore of unknown incubation, with a hardness so nearly typical that we can not ignore its peculiar quality, yet where observation without treatment has proved the absence of any true venereal taint.

The localized gumma commences as a tubercle under the skin, has all the essential hardness, and sometimes the inguinal indolent adenopathy. Its physical characters might deceive any one. It may come upon one in seemingly vigorous health, and be the only lesion present. The patient may have forgotten his old syphilis, the last symptoms of which occurred, perhaps, ten years before. I have had more than one such case. If, now, this individual has had suspicious sexual contact a month before the sore appears, his is very apt to be considered a case of re-infection. These localized gummata (pseudo-chancres) have a marked partiality for occupying the site of the original chancre—but this is not an invariable rule.

Of the third class, a sore resembling but not being a specific ulcer in any poisonous sense, I have seen a number of examples. The most striking is the following. I have no theory upon which to explain it, but can affirm that I have never seen a more typical excoriated induration as a starting-point of syphilis than was this simple inflammatory hardening :

CASE III. A young man came to me about two years ago with a tight foreskin and a contracted preputial orifice, from which a moderate amount of pus exuded. In the substance of the prepuce, at about its right lateral centre, was a hard disc with clearly defined margins, insensitive, giving to the fingers about the feel one would expect to get



from a disc of guttapercha set into the foreskin. The patient could retract the foreskin formerly, and assured me that he had seen an ulcer on the inner surface of the hard spot so long as he could expose it to view, which of late had become impossible. The sore had appeared one month after intercourse. There were two or three indurated glands in each groin.

This boy had consorted with only one female. She would not allow herself to be examined. She shared her favors among a set of young men of whom several had been patients of mine for various disorders not syphilitic. These young men continued to consort with this woman, before, during and after the date of the alleged experience in this case. All remained well excepting one, who acquired mild urethritis from intercourse too near the menstrual epoch. After a local treatment of several weeks I was enabled to retract the foreskin and inspect the lesion. It proved to be a simple livid excoriation upon a sharply defined induration. There had been no true ulcer. The whole physical appearance of the lesion was that of infecting chancre. I concluded that it must be due to mediate contagion.

No internal treatment was ever given. I watched the case several months. The excoriation healed, the induration disappeared, and no symptoms of syphilis followed.

This case is unique in my experience. I believe it to have been an unusual form of simple inflammation, traumatic in origin, due primarily to tightness of the foreskin. If it was syphilis, it was delayed syphilis.

I have seen a number of other traumatic lesions which might have been mistaken for the starting-point of syphilis, but nothing so seemingly typical as this case. In any event such cases are not common.

#### DELAYED SYPHILIS.

CASE IV. A gentleman *æt.* 37 years called upon me in September, 1883. He stated that he had had an ulcer on the penis in August, 1880, which appeared three months after exposure. This was the first venereal symptom he had ever observed. The sore was treated locally. It healed within two weeks. No symptoms followed.

In April, 1883, more than two years and a half after the alleged chancre, he fell into a sort of stupor, with fever and rheumatic pains, especially of the feet. After three weeks a spotted eruption came out upon his palms which was pronounced to be syphilitic. Then his throat

got sore, ulcers appeared in the mouth, the hair fell out freely, and, having been taking anti-syphilitic treatment already for a few weeks, he became alarmed and went to the Hot Springs. There he was treated actively. In July he had some ocular trouble, which improved at the Hot Springs. At my examination I found two characteristic palmar desquamating spots and some mucous patches in the mouth.

This case, of course, allows of a suspicion of a new infection in March, 1883, but the patient, who was absolutely free in giving his history, disclaimed it.

CASE V. X, æt. 30 years, visited me in November, 1883, stating that five years previously he had a local set of lesions on the penis, for which he received no internal treatment. He remained well one year. Then painful lumps appeared under the scalp, the throat ulcerated, the bones of the nose came away, the middle ear suppurated, rupial eruptions, scaling spots, and papulo-squamous patches came out upon various parts of his body. Then he got heart flutterings, dyspnœa, vertigo and dyspepsia. The patient denied any venereal malady up to the time of the sores first mentioned.

Anything so irregular as these two cases, of course, is a matter of suspicion, but the unexpected element in syphilis is so common, and irregularities from the normal type are so constant, that I think it possible to accept them as instances of irregular or delayed syphilis.

These last-described forms of disease, capable of causing error in the diagnosis of syphilitic chancre, are very uncommon; the first two, inflammatory hardening of chancroid and local cutaneous gumma resembling chancre, are very common. Whether it is possible that observers so renowned as the German advocates of the excision theory could be mistaken in their diagnosis in such a large percentage of cases, I can not affirm. It seems improbable, yet it is more improbable that success should follow an excision practiced upon a chancre several days old, with the inguinal glands already involved, as has been alleged, and that failure should occur in cases like those I have narrated at the beginning of this article.

#### MEDIATE CONTAGION OF CHANCROID.

The mediate contagion of true syphilis is notoriously not

impossible, several authentic instances of it being recorded. I do not remember to have seen the report of any case of the mediate contagion of chancroid, and therefore bring forward the following:

CASE VI. X, æt. 20 years, visited me in August, 1883, with an ulcer upon the penis behind the corona glandis, having a hard base. There was one hard gland in the groin, slightly sensitive. His history was as follows: After two months of continence he had cohabited with a woman who had formerly been syphilitic, but had remained free from symptoms for five years. This woman was the mistress of a friend. On the morning following intercourse the patient noticed an excoriation, which on the third day swelled up and discharged. It was then burned by a physician, whereupon the base hardened and the ulcer began to grow larger. I saw it on the twentieth day, when it had all the appearance of chancroid with an inflamed base.

Five days after exposure the patient had the woman examined. She was declared sound except as to leucorrhœa. I pronounced the sore a probable chancroid, and urged a further search as to cause. The search developed the following facts: On the night before the day on which my patient had cohabited with the woman she had had intercourse with another person, and had remained partly intoxicated and lying quiet thereafter until my patient had cohabited with her. The man in question was followed up, and found to have a well-marked chancroid under treatment. This sore he possessed at the date of intercourse with the woman.

My patient's ulcer healed after six weeks. No syphilis followed. The woman did not acquire any sore, nor did the man who habitually lived with her.

#### THE HUTCHINSONIAN TEETH.

The test teeth of inherited syphilis are the two central permanent incisors in the upper jaw. They are known as Hutchinsonian teeth, after the distinguished Englishman who first accurately described them.<sup>1</sup>

The broad, rather shallow groove on the cutting surface is the feature which distinguishes them. These teeth are often convergent or divergent, but may be straight, and they are often narrowed on the cutting edge, but not necessarily so.

<sup>1</sup> *Illustrations of Clinical Surgery*, London, 1876, Fasciculus III, Plate XI.

I have here two casts of the upper set of teeth, showing the characters usually believed to indicate inherited syphilitic disease. (Fig. 1 and Fig. 2.) I present with them Hutchinson's original plate and photograph of the woman whose teeth are pictured in Fig. 2, showing the macular syphilide which was upon her when I first saw her. The patient whose teeth are represented in Fig. 1 had inherited syphilis. The patient possessing the teeth represented in Fig. 2 showed no sign of ever having had inherited disease, and came to me with fully marked secondary syphilis, which she had acquired from her husband. I think the case is interesting as illustrating the fact that teeth very closely if not identically resembling the test teeth of Hutchinson may be possessed by a patient who has not inherited the disease. The cases are briefly as follows:



FIG. 1. CASE OF INHERITED SYPHILIS.

CASE VII. (To this case belong the teeth of Fig. 1. One of the outer incisors was crowded out of line by the contraction of the jaw, and appeared behind the alveolar border. It is not represented in the cast, which was taken by the husband of the patient, a plasterer by trade). In 1878 I first saw this patient, fourteen years old, with large gumma in the right axilla, then two years old. Her mother, who brought her, had an old syphilitic ulcer on the leg, at the bottom of which was a necrosed portion of the tibia. The child had also a large node on the left tibia. She had strabismus and bad headaches, with some scabs in the scalp. When five weeks old an eruption came out over the entire body, worse on the feet, and she has suffered from mottled, livid scaling spots and rheumatic pains ever since. Her treatment has been more or less constant since birth. The child was plainly a victim of inherited disease. The mother was frankly syphilitic, and had miscarried once and produced two dead children before the birth of this child. The father was also syphilitic (ulcers and nodes).

This patient had a variety of disorders, among which was sudden blindness for half an hour at a time; but she recovered of everything even of her strabismus, under treatment; married at the age of 17 years, produced a healthy child, then took to drink, developed a well-marked tubercular syphilide on the arms, with ulcers on the scalp; mis-carried five times in succession, and finally died.

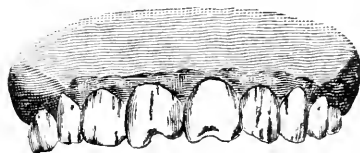


FIG. II. CASE OF ACQUIRED SYPHILIS.

CASE VIII. (To this case belong the teeth of Fig. 2). Mrs. X, æt. 31 years, visited me in February, 1884, showing flat, mottled patches of a recent papulo-erythematous syphilide, covering the trunk and extremities, with a few spots on the face. She related that her husband had a sore upon his penis, and had given her a similar ulcer upon the vulva some weeks previously. The sore was well at the date of her visit to me. She showed also mucous patches in the mouth, indurated glands, falling of the hair, etc., and the teeth as seen in the cast.

Her father and mother are alive and well, she says. She herself has always been healthy. She has no scars, no syphilitic countenance, no history and no evidence of any inherited disease. She is robust and well formed, has had five healthy children, and laughs at the idea of having suffered from any inherited malady. Actually she has recent syphilis. In March, 1885, one year later, she returned, still under treatment at the hands of her own physician, and presenting well-marked clusters of tuberculo-squamous syphilide in patches upon various parts of the body. The photograph shows the appearance of the first eruption on the chest.

#### THE ADMINISTRATION OF THE IODIDE OF POTASSIUM IN MILK.

I wish to add a word in favor of milk as a most suitable vehicle in which to administer the iodide of potassium, notably in cases where large quantities of the drug have to be used. several years ago a patient first called my attention to the fact

that he could take his dose of iodide of potassium in milk without minding the taste, which otherwise was very offensive to him.

I adopted the suggestion at once, and found it of great service in many cases. Ten grains or more of the iodide in a gill of milk (cold) makes a very palatable drink, and imparts only a mild metallic taste to the fluid, which most patients find not at all disagreeable. I have used this method in a routine way with the happiest result in several instances in those desperate cases where some portion of the nervous system gives out, food is unpalatable or can not be taken, and the indication is, disregarding all else, to push the iodide rapidly to the point of tolerance. In such a case no time can be lost, and a fixed routine system which shall accomplish all the needs of nourishment as well as medication is a very valuable factor in the treatment. I will cite one illustrative case out of a number in which I have used the method:

CASE IX. In the summer of 1883 a gentleman was referred to me from another city with precocious malignant syphilis (rupial in type) and a feeble stomach. He could not digest the iodides well, as they deranged the stomach and caused disfiguring acne, a 20-grain dose of the iodide of sodium being too much for him.

His symptoms gradually disappeared, he returned home, and for about a year did more or less well and badly until his physician, one of the most thoroughly competent gentlemen in the profession, concluded that the antisyphilitic treatment was keeping his stomach so constantly deranged that he was suffering more from treatment than the disease. He therefore omitted medication for a time, and again sent the patient to New York to see me.

He came to the city and remained in his hotel two days, not calling upon me and feeling rather better, but being much excited at night and sleepless. His only active symptom was one ulcer on the arm. On a given day at noon, while lying quietly on a lounge in his room, he got up to cross the floor. Having accomplished his object upon the other side of the room, he turned to go back, but, when half way across the floor, without warning or pain, he suddenly fell in a heap upon the floor (his age was 36 years), without loss of consciousness, and found himself unable to get up or to speak. I saw him shortly afterwards, and found him totally paralyzed upon the right side and aphasic. He had no heart disease of any kind, and the only premonition of the at-

tack had been a certain recurring numbness of the fingers and toes of the *left* side during each of several days before the attack. I procured a day and a night nurse, and ordered quiet and the cessation of all habitual food, drink and medicine, and instructed the nurses to give him each hour, night and day, 10 grains of the iodide of potassium in a claret-glass of milk.

He took in all, nearly three quarts of milk and 240 grains of the iodide of potassium, in the first twenty-four hours. A laxative was the only other thing allowed. I increased the daily dose 2  $\bar{5}$  each second day, and after a week employed also inunctions of mercurial ointment, which I pushed rapidly until the gums were mildly touched.

During the second week his daily dose reached 1 $\frac{1}{2}$   $\bar{5}$  of the iodide. He took no food whatever except the milk in which his medicine was given, and he took an occasional laxative. His tongue cleared, the acne disappeared from his face, and early in the second week he began to move his arm and leg spontaneously. Electricity and massage were now added, and in one month from the date of the attack he left the city, walking with a cane and dragging his foot slightly, but talking about as naturally as ever and looking exceedingly well. The daily dose was then 10  $\bar{5}$ , taken in four separate portions, for as he got better I gave up the hourly medication, and allowed him to eat.

The patient is still under observation, doing well, taking 10  $\bar{5}$  of the iodide a day, which he has continued for several months, and promising nearly, if not quite, a perfect recovery.

## EDITORIAL ARTICLES.

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### TUBERCULOUS SURGICAL AFFECTIONS.—VOLKMANN'S CLINICAL OBSERVATIONS.

At the Congress of German Surgeons, held in May last, the subject of Tuberculous Surgical Affections was introduced by a communication of some length from Professor R. Volkmann, the Director of the University Clinic at Halle. This paper has since been published in a supplement to the *Centralblatt f. Chirurgie*, 1885, No. 24.

In pursuance of the plan adopted in the early part of the present year to gather and digest for the readers of the ANNALS OF SURGERY, the more important contributions on this subject which current surgical literature may contain (Vid. Vol. I., pp. 233, 273, 284, 466; Vol. II., p. 71), this paper also is now presented. A special importance attaches to it, because of the extent and variety of the experiences which it covers, and the continuity of the observations recorded since they have been observed and recorded under identical conditions and the inspiration of a single mind. The paper is introduced by the observation that there are two classes of facts and experience which, at the present day, determine the views of the great mass of physicians as to the clinical character and clinical significance of tuberculosis.

First. The almost regularly fatal termination, or the dangers at least enormous, of tubercular disease of internal organs, especially the lungs, larynx and intestines. The theory of tuberculosis has been developed from experience with pulmonary consumption. Even now it is difficult for many physicians, in case of an individual suffering from any tubercular affection, not to immediately think of a probably existing or prospective lung tuberculosis.

Second. The general conviction that tuberculosis is really an infectious disease, that inoculation and direct injection of tubercular mate-



rial into the blood produces general miliary tuberculosis, and that the undoubted bearer of the virus is found in the tubercular bacillus.

But the experience which clinicians trusted with the so-called nobler organs have the opportunity of making does not apply to disease—caused by the like poison—of organs, parts and tissues which toward this poison are differently and physiologically far better circumstanced, and which, for the preservation of the organic whole, are of no direct account. It is, therefore, not astonishing if the experience of physicians and surgeons does not coincide in many points.

Inoculation with tubercular material or with pure cultures of its bacillus, as well as the direct introduction of the same into the blood, have indeed contributed greatly to our understanding of the processes in acute general miliary tuberculosis, but they have not been able to produce local processes identical with tubercular, even anatomically, not to mention their clinical course. Tubercular disease of the various organs and localities leads, in only a relatively small quota of cases, to general infection, and then rather accidentally in consequence of specially unfavorable local conditions, and often after a long period during which the process preserves a local character. To apply conclusions and experience derived from inoculation and general miliary tuberculosis, without reserve to localized tubercular trouble, is inadmissible. All the more important under these circumstances appears the fact that through the investigations of the last fifteen years the terrain of the tubercular diseases with which the surgeon has to do has been so enormously extended—in that a great number of diseases with which he has daily to deal have been recognized as tubercular. The surgeon has almost more to do with this affection than the physician, and the position of surgeons for the study and treatment of tuberculosis is by far the most favorable. We not only have the diseased organs directly before our eyes, but we cut into the tubercular tissues and inspect them. We are often able to expose the whole depot and even its immediate vicinity. In the present status of our knowledge and needs many of our operations are to be considered as autopsies *in vivo*. We remove the tubercular tissues, or even whole organs, and examine them while the patient lives on and is observed further. We are in condition to apply physical, chemical and thermic means—remedies of every kind

—directly to the said tissues and observe their effects. A great number of questions regarding this, one of the most important diseases of mankind, will, in the near future, have to be solved by the surgeon.

After these introductory observations, the paper proceeds to discuss, seriatim, tubercular diseases of the various tissues and organs, and concludes with certain general considerations. The propositions of the author are as follows :

TUBERCULAR DISEASES OF THE VARIOUS TISSUES AND ORGANS.

I. *Tuberculosis of the Integument and Cellular Tissue.*—1. Lupus is a genuine tuberculosis of the skin, though it is to be considered as a special form, and occurs more frequently in individuals not hereditarily burdened. It is clinically distinguished by its great tendency to local relapse—in opposition to other forms of skin tuberculosis, into which latter lupus may pass. Prognosis in these changed forms is more favorable as regards permanent local cure, less so as regards later appearance of equivalent tubercular process in other parts, tissues and organs.

2. The tubercular ulcerations of the skin, distinguishable from lupus, correspond largely to the scrofular ulcerations of former writers. They occur principally in children and young persons, but are not overfrequent if we exclude cases developing secondary to tubercular abscesses of lymphatic glands, and tubercular joint and bone fistulæ. They are, almost without exception, curable by surgical methods, without local relapse.

3. Primary tuberculosis and primary tubercular abscesses arising therefrom, of deeper connective tissue, viz., intermuscular, parossal and para-articular layers, are very infrequent and to be diagnosticated only with great caution. In the great majority of cases such abscesses are connected with specific affections—forming the primary trouble—of bone, joint or lymph gland. The present treatment of these abscesses by free incision and scraping permits the easy recognition of such connection; when it is not demonstrable on the operating table it is not to be forgotten that tubercular foci—especially in bones—from which the apparently primary tubercloses of the cellular tissue arise, are often small and easily overlooked; further, that the abscesses not rarely appear so late that, meanwhile, the causal osseous affection has healed up. This holds

especially in the cold abscesses (congestion abscesses?) of spondylitis. In favorable cases it is possible by free incision, antiseptic injections and drainage with compression for a few days, to permanently cure by a kind of primary union. Of fifty-seven cases of spondylitis with gibbus, in the last few years, twenty-three were thus cured. This proves that no more pus or debris from the tubercular tissue was supplied to the abscess.

4. As a primary disease tuberculosis of the cellular tissue occurs especially in the panniculus adiposus of small children. Either at the same time or in rapid succession, a number of firm, flat nodules (gommes tuberculeuses) form under the skin. These soften; the skin usually becomes involved and bluish-red in color, and fluctuation increases until it breaks. This has for a series of years been characterized in lectures as the *furuncular form of skin and connective tissue tuberculosis*. Early incision with discharge of pus, of the large chunks of cheesy and necrotic connective tissue not rarely present, as well as of the fungous granulations attached to the abscess walls effect speedy cure without local relapse. True, the process sometimes spreads from single nodules deeper down instead of towards the skin, and large tubercular abscesses arise beneath the unchanged integument. This is positively a form of tubercular connective-tissue abscess which has no connection either with diseased bone, joints, tendon-sheaths or lymphatic glands.

5. Tubercular abscesses, whether they represent primary forms from the connective tissue, or are connected in the repeatedly-mentioned manner with joint or bone affections, are, after existing sometime, lined with a peculiar violet-gray or yellow-gray opaque membrane. This may attain a thickness of several millimetres. It is relatively nonvascular, especially in its inner layers in contact with tubercular pus, and contains an innumerable mass of miliary tubercles, so that it not rarely appears to consist wholly of them. This abscess-membrane can be easily wiped, scraped or prepared from the subtissues, often in inch-square pieces. The tissues beneath are, beyond a slight reactive induration, perfectly healthy. As good as never do diffuse tubercular eruption and cheesy infiltration extend into these neighboring tissues. In certainly over a thousand such cases freely laid open and examined in

the living subject, I have but twice observed a diffused penetration of the tuberculosis into the muscles forming in them the abscess-walls.

Where, in opening abscesses with cheesy contents, diffuse caseation of the muscle structure is met with, it usually depends on syphilis and cheesy-softened gummata. The diseased tissues here offer great resistance to the sharp curette, and can not be easily rubbed off, or even with a deal of force be separated clean off. The characteristic abscess-membrane is wanting. These two peculiarities assist also in recognition of actinomycotic foci penetrating muscles, and sometimes resembling tubercular abscess.

The characteristic membrane occurs only in tubercular abscesses, and is accordingly to be considered an absolute positive diagnostic criterion.

6. The class of non-tubercular chronic and so-called cold abscesses, occurring especially in the course of and after infectious diseases, must be defined by new investigations. In any case it is much smaller than that of the tubercular abscesses.

## II. *Tubercular Affections of the Mucous Membranes Accessible to the Surgeon.*

7. Tuberculosis of the tongue. This occurs partly in form of sores, having some a torpid and some a fungous character, partly in form of penetrating nodules, which soften centrally. Solitary tubercular ulcerations of the tongue, with fungous vegetations and somewhat indurated surroundings are readily mistaken for cancer, especially in elderly individuals. I have twice made this diagnostic mistake myself, the error being determined by microscopical examination after extirpation. On the other hand the nodular form is often hardly to be distinguished at first from gummatous affections of the tongue. In its later course the cheesy-purulent melting away of the lump and transformation into a characteristic abscess, its manner of opening and the whole subsequent course of the disease, leaves no doubt as to its character and significance.

Of the patients operated on by me, partly by scarifying and application of thermocautery, partly by extirpation of a wedge from the tongue; the great majority died later of bone or lung tuberculosis. Some, however, have remained healthy for years, even when hereditarily handicapped.

Whether on the tongue there are tubercular processes classible as lupus is uncertain. At autopsies of persons dying of bone and lung phthisis I have twice found the entire lingual surface occupied by very flat, pin-head- to lentil-sized, confluent tubercular ulcerations between which lay characteristic little miliary nodules. The process had arisen during the last weeks of life and been considered aphthous.

8. Tuberculosis of the pharynx and palate I have seen almost exclusively in young persons—at puberty, or soon after. Flat, lentil-sized and larger, confluent sores with a yellow base, which extend out from the palate arch over the posterior pharyngeal wall and the entire posterior surface of the velum. Under strong illumination the miliary tubercles can usually be seen lying between the separate ulcerations. The affection may readily pass for congenital syphilis.

Extensive adhesions of the cicatricially contracted palatal folds, with complete or nearly complete closure of the pharynx from the nasal cavity, result more frequently from healed tubercular ulcerations than from syphilis. The latter in its severe forms produces rather defects in the palate; tuberculosis, on the contrary, more readily extensive ulcerating surfaces which, of course, favor later adhesion.

Energetic surgical treatment is more readily instituted and has a decidedly better prospect than in tuberculosis of the larynx. True, most patients, if not already having that trouble, die likewise from lung affections, but by early local treatment with caustics, the actual cautery, scraping out, etc., permanent cures do occur, and have been repeatedly observed by me.

9. There is an *ozæna tuberculosa*, depending on the formation of true tubercular sores in the nasal membrane and sharply separable from the infinitely more frequent, so-called scrofular rhinitis, dependent only on catarrhal conditions. Still more rarely does primary tuberculosis of the bony framework of the nose and upper jaw lead secondarily to infection and specific disease of the nasal membranes.

10. Twice have I seen severe tubercular ulceration (not lupus) of the lips. Once in a young girl with multiple tubercular deposits and healthy lungs; once in an old woman. The penetrating sore in the first case was remedied by a wedge incision; in the second the shallower ulceration, which had been mistreated by superficial cauterizations, was

covered with thick crusts, and surrounded by sclerotic connective tissue, was considered to be a cancer. Here excision and plastic operation were necessary.

11. *Fistula ani.* Some rectal fistulæ have from the start the significance of tubercular sores. The connection of rectal fistulæ and lung tuberculosis, so emphasized by the older surgeons, is hereby explained, or rather corrected. A tubercular rectal fistula is distinguished from a non specific one by its tendency to form large masses of fungous granulations, widespread separation of the mucous membrane and undermining of the external skin, as also sinuous abscesses.

Their treatment is, therefore, that of tubercular abscesses: Free opening, scraping off of fungous granulations, removal of thin edges of skin and mucous membrane; open treatment with antiseptic mull tampon, especially iodoform tampon. In rebellious cases, additionally, by cauterization with the hot iron.

12. Analogous to tubercular rectal fistulæ are the rare cases of insiduously developing perityphlitis occurring in otherwise healthy individuals, or who at least have presented no previous symptoms of intestinal tuberculosis, arising after the perforation of a single specific intestinal ulceration, and running in like manner to the formation of large tubercular abscesses, multiple fistulæ and extensive separation of the skin, and to the production of a mass of tubercular (fungous) granulations.

### III. *Tuberculoses of the Uro-Genital Apparatus.*

13. Tuberculosis of the testicle, though principally observed in youthful or maturer manhood, occurs, however, even in the oldest. Besides, in old people there is simply suppurating, chronically progressive orchitis and epididymitis which is to be separated from the tubercular form. After tubercular disease of one testicle, the other is attacked later—sometimes not till years after. But even in the severest cases, where the epididymis is already caseated and destroyed, and the testicle itself permeated with the thickly-packed miliary tubercles; those in which ablation of the testicle is done not so very rarely remain for years perfectly healthy, and neither in the lungs nor in other organs acquire fresh tubercular deposits.

It is, therefore, desirable, especially in youthful subjects, to do castration as early as possible, before the spermatic cord is diseased, and

the process has reached the prostate and bladder, and not to delay long with partial resections, scrapings or cauterizations. In the case of old people in whom the affection runs a more benign course, such a conservative and expectant method is more to be recommended.

Resultant disease of the spermatic cord appears either as a uniform thickening or in the form of separate enlargements, shape of wheat grains, in the course of the vas deferens.

14. Tuberculosis of the bladder, ureters and kidneys present one of the most typical and severe of all tubercular affections. Even in cases where the process has remained localized to the bladder, cures can scarcely have been observed. The proof of tubercular bacilli in the urine admits early, positive diagnosis.

Whether, in tuberculosis of the renal pelvis and kidney, operative procedures, nephrotomy and nephrectomy, can be of real avail to the patient, is uncertain.

15. I lack sufficient experience of my own with tuberculosis of the vagina and uterus, and the treatment of this affection will doubtless fall chiefly to the gynæcologists.

16. Tuberculosis of the mamma is exceedingly rare, its clinical diagnosis possibly only in its later stages. Its therapeutics consist in amputation of the breast and clearing out of the axilla, since the axillary glands are apt to be infected early. It is important to know that chronic indurative (not abscedizing) mastitis sometimes leads to enlargement of glands in the axilla, which later becomes tubercular, and grows to fist-sized, cheesy glandular convolutions, without the mamma itself having become tubercular.

#### IV. *Tuberculosis of the Bones, Joints and Tendon-Sheaths.*

17. Everything heretofore denominated caries of bone, pædarthrocase, spina ventosa, scrofulous inflammation of bones and joints, tumor albus, fungus articuli, strumous joint affections and, most recently, after Billroth, fungous inflammation of bones and joints, belongs, with the rarest exceptions, to genuine tuberculosis.

18. Besides tuberculosis, a row of other infectious diseases are to be considered as ætiological factors in the development of chronic bone and joint suppuration, most of which, however, set in acutely and become chronic in their farther course. Infectious osteomyelitis, the

most frequent of these, often leading to suppuration of the joint and destruction of its articular cartilage—furnishes such a characteristic clinical picture, even when not beginning quite acute and with fulminant symptoms, that diagnostic difficulties can arise, if at all, only in the rarer form of osteomyelitis epiphysaria, or in localization of the process in the short bones.

The cases also of bone and joint suppuration from syphilis, acute articular rheumatism and septic infectious processes of every kind are for the most part readily distinguishable from the tubercular forms. Difficulties with regard to the determination of their character arise chiefly from the so-called metastatic joint inflammations after the acute exanthemata, when these have progressed to suppuration and destruction of the joint. Part of these cases have simply the significance of septic or pyæmic processes. In others it is undoubtedly tuberculosis, developing during the existence of the exanthem or immediately after, and often setting in very acutely. It is therefore questionable to what extent, in the acute exanthemata, suppurative and destructive articular inflammations occur that are actually produced by the specific (exanthematic) disease poison.

19. Tubercular inflammation of joints starts primarily, either in the bone or synovial membrane. The primary ossal form is considerably more frequent, especially in children. It begins with the formation of circumscribed tubercular foci in the bony epiphyses. These, as a rule, remain small, not exceeding the size of a pea or hazelnut. Diffuse cheesy infiltration of larger portions of the cancellous tissue are very rare. At the beginning, therefore, it is not at all an articular but an osseous trouble, and may remain such if softening and suppuration of the tubercular deposits does not occur, or if they open outside of, instead of, into the joint. At any rate, the simple osteopathic stage may continue indefinitely before specific disease dependent upon infection of the joint occurs. This does not happen until the products of the cheesy breaking down and tubercular bone-suppuration gets into the joint.

Tubercular deposits in the cancellous, especially in children, have a great tendency to mortify in toto and separate themselves as characteristic cheesy concrement-like sequestra. The process of demarcation thus occurring, evidently has a favorable action since it creates a barri-



er of granulations; true, its inner layers are uniformly found permeated with most abundant miliary tubercles, but this protects the adjacent bone from farther infection. Rarely do the cheesy sequestra and cheesy collections of pus in tubercular bone-cavities give rise to new (secondary) tubercular infiltration of the neighboring cancellous.

Multiple deposits (usually not exceeding two or three in number) frequently exist, partly in the same epiphysis, partly in both articular ends at the same time. They have a predilection for certain parts, *e. g.* the olecranon, the iliac portion of the acetabulum, etc., though this has not been established by exact statistical investigation.

20. The primary synovial form of the tubercular joint-inflammation occurs more in adults, particularly in elderly people. It shows a preference for certain joints, *e. g.* the knee. The miliary tubercles thickly occupying the synovial membrane develop either with or without very abundant vascular and granular proliferation. In the first case we have the common fungous form; in the second, torpid articular suppuration, denominated cold abscess of the joint by the older writers. The second form is oftener seen in elderly people, and seems to offer a particularly unfavorable prognosis.

21. Sometimes larger isolated tubercle-nodules form on the synovial membrane; they may grow to the size of an almond and even to a dove's egg, and project, pedunculated, into the joint. The remaining synovial membrane may, at the start, remain free; later it is usually occupied by the miliary process. Cure after extirpation of the nodule and temporary drainage of the joint is possible even in the last named cases.

22. It is an important question how far originally non-tubercular joint-inflammation may, in its later course, become so. At present this is proven only for the rarer cases of fibrinous synovitis with possible formation of rice bodies and for chronic dropsies with hyperplastic proliferation of fat-villi.

23. Tubercular joint-inflammations, whether starting primarily in synovial membrane or bone, do not necessarily produce suppuration of the joint or abscesses even in the severest forms (*caries sicca*), leading to extensive defects in the bone. Sometimes, however, a large

inroad of tubercles into the synovial tissue is followed by a free, watery exudation—hydrops tuberculosis.

24. Regarding the therapeutics of tubercular joint-inflammation, I hold that parenchymatous injections of tincture of iodine, carbolic acid, sublimate, arsenic, etc., have no results so far worth mentioning. Puncture of the joint with a coarse trocar, followed by disinfecting injections, is only effective in exceptional cases (hydrops tuberculosis, etc.)

The principal operative procedures to be considered are:

*a.* Incision (if possible, double incision) and drainage, with or without curretting the joint with the sharp scoop (arthrotomy).

*b.* Total extirpation of the joint capsule—after a large incision opening the joint as in exsection—with retention of the bony epiphyses and joint-cartilage (arthrectomy, respecting arthrectomia synovialis).

*c.* Resection of the joint, combined with extirpation of the articular capsule; retention of healthy portions of bone; frequently but a partial or, at least, atypic resection (arthrectomia ossalis et synovialis)

Retention of the much diseased “fungous” capsule—ample decapitation of the head of the femur or humerus—as formerly practiced, without complete and very exact denudation of the socket, is to be discarded.

As to the use of the sharp scoop, it should be borne in mind that with it the intermuscular peri-articular and subcutaneous abscesses connecting with the diseased joint or osseous foci, and lined by characteristic readily separable membrane, may be completely freed from all tubercular granulations, and further, that the sharp curette proves sufficient, even on bone, since the usually softened tissue can be scraped down to the cancellous; that, however, the like is not possible on tubercular degenerated synovial membrane. Here the granulations infiltrate the fibrous layers of the capsule, and no abscess membrane readily separable from the healthy tissues is present. Consequently, if the synovial membrane is very much diseased, relapses readily occur. When here the sharp scoop is used, operate with large incisions (which allow a full oversight) after constriction and follow up with exact antiseptic disinfection and aftertreatment.

25. Tuberculosis of the bones without participation of large joints is chiefly represented clinically by the following types:

*a.* Spina ventosa (pædarthrocace), bottle-shaped enlargements of phalanxes of fingers and toes, also of the metacarpal and metatarsal bones, exceptionally also of the ulna and radius, or even tibia and femur; usually multiple, and dependent on a tubercular osteomyelitis. This affection develops only in the first years of childhood, and despite its multiplicity often heals without perforation, suppuration or formation of a sequester, so that no disturbance in the form or growth of the affected bones remains.

*b.* Tubercular suppuration and necrosis of the orbital portion of the upper maxilla with consequent characteristic ectropion of the lower lid, likewise preponderating in younger children.

*c.* Cold (tubercular) abscesses of the skull, dependent on small tubercular necrosis of cranial bones, usually penetrating the cranial cavity. Chiefly in adults.

*d.* Tubercular caries of the ribs; and, finally:

*e.* The common form of spondylitis (Pott's disease). Contrary to tradition in the compends, however, it would be much better to place this affection under tubercular joint-inflammation, since here the same unfavorable factors come into play, after the usually early occurring destruction of one or more inter-vertebral cartilages, as in the joints; the mobility of the separate segments towards each other, the burden of the body-weight, the progressive destruction of the inflamed osseous parts pressing together, and the coinfection of the same.

It is noticeable that in adults tuberculosis of the bones almost never attacks the shaft, and that here chronic osteitis and periostitis developing in the diaphysis is usually referable to other causes (syphilis, chronic form of infectious osteomyelitis).

26. Even the largest sinking abscesses coming from the bones and joints can be freely opened without danger in case it is done with all precautions of antiseptics and antiseptic aftertreatment. Early opening of such abscesses is desirable.

27. Wounds, after joint and bone operations for tuberculosis often become again tubercular before complete cure. Fistulæ and drain-canals fill with "fungous granulations," united parts of the wounds open again, new tubercular abscesses form. Energetic treatment by renewed curetting, thermo-cauterization, free opening and, especially, tampon-

ade of the gaping completely cleansed wound with antiseptic mull (particularly iodoform and sublimate) is here to be recommended.

The latter procedure may perhaps be called the more effective, and in the severest cases may often be adopted at the start, after the first operation. I do not consider it advisable to overdo this principle of open treatment, since, according to experience, complete primary union is often achieved.

The principal thing is not to delay too long with an after operation, in case of tubercular relapse in the wound, lest the disease extend too far, and as soon as a new relapse appears to attack it again. Often four, six and more operations in intervals of a few weeks are necessary to diminish and limit the diseased focus and finally achieve complete and permanent cure.

28. It appears as if operating a joint or especially bone tuberculosis, sometimes, in consequence of the entrance of tubercular virus into the open lymphatics, gives rise to an acute general miliary tuberculosis (usually including basal meningitis).

29. As long as the disease-type, denominated by the ancients, tumor albus, arthroceae, Pott's disease, spina ventosa, etc., has been recognized, it has been known that even the severer cases, particularly in children, frequently recover spontaneously; and that individuals with limbs more or less impaired in motility and function, and with scars proving the extent and severity of the process, not rarely reach advanced age. Since all these troubles represent but forms of joint and bone tuberculosis, it is not at all necessary to discuss the possibility of a spontaneous cure of the same.

30. Tuberculosis of the tendon-sheaths occurs partly in the form of diffuse fungous disease in these structures, partly in that of solitary nodules (isolated tubercles). Since the said sheaths usually lie close to joints, we should take care, after fistulous perforation, not to mistake for joint and bone affections.

Therapy: Excision of diseased tendon-sheaths, curetting, etc.

#### V. *Tuberculosis of Lymphatic Glands.*

31. In all the tubercular affections so far considered the lymphatic glands that receive material from the affected region may become infected and tubercularized. This trouble, formerly called scrofular in-

flammation or cheesy degeneration, is genuine tuberculosis, yet the susceptibility to tubercular virus and the tendency to tubercular degeneration is very widely different in the glands of different parts of the body.

The cervical glands are by far the most readily affected, then the cubital; more rarely those in the axilla; most rarely the popliteal and inguinal. In the severest tubercular affections of the bones and joints of the foot, tuberculosis of the inguinal glands is but very exceptionally found.

32. In particular constitutional disposition (scrofula) and unfavorable heredity simply hyperplastic irritative and inflammatory glandular enlargements—such as consensually or sympathetically follow inflammatory and catarrhal processes of the skin and mucous membrane—become tubercular later. After removal of the causal affection, the glands do not reduce but enlarge, caseate and soften, and examination after extirpation shows genuine miliary and bacillary tuberculosis.

This process (scrofula of glands) is indeed most frequently observed after primary affections, which are themselves classed under scrofula, as, *e. g.*, glandular enlargements after cutaneous eruptions, chronic catarrhs, blenorrhoea, etc.

33. To what extent non-tubercular (non-bacillar) caseation of the lymphatic glands occurs has not yet been definitely settled.

34. Tubercular glands are best removed with the knife, and, where in a mass as usual, according to the same principles as with affected axillary glands in mammary cancer.

Scraping out softened tubercular glands with a spoon is not trustworthy, because the diseased capsule, at least, and generally also enlarged and affected neighboring glands, though not yet softened, remain, and occasion relapse. Still scraping out can not always be avoided.

35. Whether arsenic used internally is useful in tubercular (scrofular) tumors of the lymphatic glands must be determined by farther observation.

#### VI. *General Considerations.*

36. The tubercular character of an affection is not to be doubted; if

inoculation yields positive results, the tubercular bacillus is found, and anatomical examination demonstrates the known structural relations in the diseased tissues. All three conditions are fulfilled in the previously treated affections. On the contrary, it is not yet proven that tubercular tissue must invariably present the follicular arrangement.

37. Dissemination of tuberculosis results through various channels and in very different ways:

*a.* By the original focus growing.

*b.* By the tubercular virus (bacilli) penetrating from its original seat into the lymphatics. This probably very frequent, almost regular, course does not ordinarily lead to generalization, in that the glands not only retain the disease germs but also evidently destroy them in many cases. The significance of the lymphatic glands as a protective apparatus and filter in local infectious processes of every kind has not been sufficiently recognized. Even if the gland is infected and becomes highly tubercular, still generalization has a long road before it, since in case the virus gets beyond this it is again in glands higher up. Generalization does not occur until the last gland between the diseased part and the blood-current is overcome, or the thoracic duct itself is diseased.

*c.* By penetration of the poison from a neighboring tubercular deposit into a serous cavity; this may occur either from extension of the focus to lining of the cavity, or by rupture of the bacilli-containing products of suppuration and softening. Its farther distribution is brought about partly by the fluid in the respective cavity (synovia, exudation, etc.), partly by the gliding of the cavity-walls in functional movements of the adjacent parts. The danger here depends chiefly on the size and importance of the serous sac, the arrangements of its lymphatics, and further on the rapid transformation of the cavity wall into a layer of granulations (which has perhaps occurred previous to perforation) which constitutes an impassable barrier.

*d.* By the introduction in like manner of the tubercular virus, or products of suppuration and degeneration containing the same, into the canals and cavities lined with mucous membrane, in which the poison either stagnates or has to traverse a long distance before its excretion from the organism and the membrane of which it infects by

contact, occasioning new miliary eruptions. Certainly the most unfavorable case here is the bronchi-canalized lung, where the virus not only establishes new foci in the bronchi and their immediate vicinity, but infects the larynx and, swallowed as sputum, reaches the intestine, finally infecting it also.

*e.* By penetration of the poison from a near focus into a permeable, usually large, vessel, especially a vein, or into a lymphatic leading directly into the blood, whereupon generalization—acute general miliary tuberculosis forthwith follows. Tubercular disease of a vein-wall from an adjacent deposit is to be considered the most common cause of this process.

In considering the possibilities it is evident that tuberculosis of bone, skin, cellular tissue, joints and lymphatic glands present far less danger than that of the respiratory organs or intestinal tract. Fistula ani is so far more favorably situated that the infectious material is at least rapidly discharged; on the contrary, tuberculosis of the urinary passages is, as regards this danger, no more favorably situated than that of the lungs and intestines. Tuberculosis of the testicles can be successfully operated as long as the spermatic is not affected, etc.

38. Susceptibility to tubercular poison is, in man, limited to certain individuals, and even in these again to certain times and definite organs and tissues. From the frequency of tubercular disease of every kind in Northern Europe, every man must have often enough received tubercular poison, above all those who uninterruptedly associate with the tuberculous.

39. In the forms also with which the surgeon has to do, this susceptibility usually comes from hereditary want of resistance. Still the clinical material of hospitals and dispensaries is poorly adapted to statistical investigation of this matter, because patients from the poorer classes are usually able to give but little account even of their near relatives—not to mention the great circle of blood-relationship. The experienced, older physician who overlooks whole families will find that fungous arthritis, caries, tubercular lymph-adenoma, etc., do not generally occur in healthy families.

40. Tubercular disease often appears multiple, either :

*a.* Directly on the first reception of the poison it is deposited in sev-

eral places. The multiplicity of foci in spina ventosa is known. Heretofore less notice has been taken of the acute invasion by multiple foci developing rapidly, one after another, in entirely different organs and tissues of previously perfectly healthy individuals, and occurring as well in children as in adults, and even elderly people. Those affected often succumb to such an attack; they may, however, outlive the storm and ever after remain healthy.

*b.* Or the tuberculosis appears multiple on repeated independent infection from outside. A person suffers from tuberculosis of the lymphatic glands in youth, has a tumor albus or arthrocaecia towards puberty, and dies from pulmonary consumption in the thirties. This is very common and can not appear astonishing, since the susceptibility to the said virus is not lessened by having withstood a tubercular infection. The persons in question possess, at least in the great majority of cases, an individually increased susceptibility to the poison, and this is about them everywhere.<sup>1</sup>

41. There is, therefore, no reason in cases of multiple focal disease to consider the more recent as a secondary or ante-infection arising from the older localization, nor, as has repeatedly been done of late, to vindicate the metastatic character of tubercular joint and bone disease; so far this is only proven for the localization of acute general miliary tuberculosis. Auto-infection is limited to the cases noted in paragraph 37, *b* to *d*.

42. The operative removal of a tubercular deposit will, of course, make it impossible for an acute general miliary tuberculosis or the farther infection of lymphatic glands to arise from this point, but it does not prevent equivalent disease arising later in other places, and does not do away with the danger of later pulmonary tuberculosis. An in-

<sup>1</sup> In practice, certainly, the two forms of multiplicity often can not be distinguished; and even their anatomical separation would often be very difficult, if the pronounced opinion of some authors and myself is correct, that the tubercular poison after its introduction into the body may remain a long time before it finds favorable conditions for development. Foci of apparently very different age and in very different stages of development might possibly then be attributable to one and the same infection. The theory of the metastatic character of focal tuberculosis (cf. following paragraph 41) would then lose even a sure anatomical foundation.



dividual who, *e. g.*, in youth had undergone amputation of the thigh for a tubercular knee-affection, remains even after his tenth or fifteenth year endangered, or at least the object of anxiety, because in him susceptibility to tubercular poison has been proven, and though not necessarily, yet possibly, still continues.

43. Local relapses after operations for tubercular disease, the wound becoming again fungous, etc., do not have their cause in the patient's constitution or in the tubercular or scrofulous diathesis, as is usually imagined; they are rather exclusively conditioned by the incompleteness of the operation, the fact that somewhere there remained tubercular tissue which afterwards increased and infected healthy granulations, tissues and cicatrices anew.

After amputation in perfectly healthy parts, relapses at the stump (a becoming fungous of the amputation-wound) do not occur, even in persons with advanced pulmonary tuberculosis. On the contrary, in such cases the dry tissues of the emaciated limbs heal very readily by primary union. It is therefore desirable, if amputation is performed, not to leave any fistulæ in the flaps.

I have never seen in a scrofulous child or in a tubercular person, even with manifest lung phthisis, the wound become fungous after amputation for trauma, extirpation of a lipoma, injury or tearing of the soft parts taking months to heal, complicated fractures, etc. I put the question: Has any one ever certainly observed such a course? The communication of such cases, exactly observed and investigated, would be of great importance.

44. Despite all this, the great majority of all tubercular bone and joint troubles are certainly traceable to causes; still, not to severe wounds and injuries, but to light wounds, contusions, distortions, which would have had no farther consequences in persons having no susceptibility to the tubercular poison.

That distortions of hand or foot frequently lead to tubercular joint and bone affections (caries) can not be disputed. Spondylitis, also, usually develops in children after a fall or tumble.

It must be assumed that after a severe trauma (subcutaneous fracture, large wounds, etc.) the energy of the reactive and reparative tissue proliferation is so considerable as not to allow the development of tu-

bercular germs, an hypothesis for the admissability of which the conduct of the lower organisms offers numerous analogies. On the other hand it would appear that light injuries, combined, perhaps, with extravasation into the cancellous, slight synovial exudation and, in any case, certain changes in the nutritive conditions of the affected tissue, furnish a favorable basis for the development of the tubercular bacillus.

45. Not without surgical significance is the question how far the said bacillus, of itself, causes suppuration, and to what extent softening and caseation of tubercular deposits, is favored by the access of septic material which finds a favorable bed in the dead tissues of just such foci.

The regularity of softening and ulceration in tuberculosis of the respiratory and of the intestinal tracts contrasts very noticeably with the extreme frequency with which bone and joint tuberculosis heals, or at least for long years exists, without suppuration. Older writers have often pointed out that high fever precipitated the softening in tubercles.

Not rarely quite acute suppuration, even with septic phenomena, appears in chronic tubercular bone or joint affection that long took a favorable course without any suppuration.

46. Tuberculosis shows the widest difference in children and adults as regards localization of the foci in the various organs, tissues and parts of the body; likewise in regard to curability and danger to life. A more exact statistical determination of these points is desirable.

Thus it is known that typical spina ventosa occurs only in small children, tuberculosis of the shoulder joint almost exclusively in adults; likewise the very torpid tubercular suppuration of the knee is almost always seen in adults.

Cure results far easier in children than in adults.

Tubercular troubles in children are very much more frequently recovered from without causing suppuration. The severest tubercular bone and joint suppuration, combined with most extensive destruction, may, in children, heal, even spontaneously. There is a large field here for conservative surgery; while in like cases in adults cure can only be achieved by removal of the diseased parts, and often enough only by amputation.

Tubercular joint and bone affections are more self-limiting in children. Diffuse suppuration of the entire carpus, so frequently occurring in adults, especially elderly people, is here hardly ever observed. If we do meet a rare case of suppurating tuberculosis of the wrist in a child, the process remains limited to the wrist-joint proper. All the cases in young children observed by me were cured by drainage, or where necessary, curetting. On the foot similar conditions prevail, though, perhaps, less sharply prominent. Prognosis becomes worse towards puberty, cases increase where conservative measures no longer suffice.

Local tubercular disease of other organs combines far more rarely in children than in adults with fatally progressing lung tuberculosis. In an older individual having, *e. g.*, caries of the wrist, it is exceptional that he does not have or is not soon attacked by pulmonary tuberculosis.

47. The dispute over the identity of tuberculosis and scrofulosis is not yet concluded. The first thing to be determined is what forms of milder so-called scrofulous affections are produced by the tubercular bacillus. In one case of eczema on the arm, that I believe any dermatologist would have diagnosed as eczema, and which I had examined because of the existence of scrofulous softened cubital glands, tubercular bacilli were found in the scraped-off eczematous epidermis.

It would then have to be determined to what extent scrofula produces chronic inflammations, hyperplasia, and, in general, tissue changes furnishing a favorable nutritive basis for tubercular virus. Such a condition seems to be proven for the lymphatic glands.

Finally, it should not be overlooked that in this dispute, often the question at issue has not been formulated in a sufficiently logical manner. Under tuberculosis the local process is usually thought of; under scrofula, a certain constitutional or nutritive anomaly of an unknown nature, a special disposition, diathesis, hereditary handicap, which in a great part coincides with that assumed for tuberculosis.

A person who, on the closest examination of his organs, presents no deviation from normal, and not the least local change, is not called tubercular; but a child is called scrofulous who, though at the time blooming and perfectly healthy, has previously experienced a series of

affections classed as scrofula. Indeed, it would, perhaps, be called scrofulous, if some only of its brothers and sisters had suffered from scrofular affections and tuberculosis was at home in the family.

48. It is not to be doubted that certain medicaments applied locally to tubercular tissues exert a curative, perhaps even a specific, influence. The favorable influence of mercury preparations (blue ointment) on lupus, *e. g.*, is not to be questioned. Still the views are very divergent, and a farther continuous comparative testing of such remedies is highly desirable. Iodoform, iodine, arsenic, lactic acid, etc., besides the mercury preparations, are to be especially considered.

The above holds true in a still greater degree of the internal use of drugs.

WM. BROWNING.

## INDEX OF SURGICAL PROGRESS.

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### Extremities.

I. AMPUTATION FOR SENILE GANGRENE. By HARRISON CRIPPS, F.R.C.S. (London). A gouty, intemperate man, æt. 65 years, the subject of albuminuria and glycosuria, was attacked by gangrene of the toes, spreading to the foot. Antiseptic amputation in lower third of leg was quite successful. Gangrene appearing afterwards in the heel of the opposite foot was treated antiseptically, and healed slowly. The sugar entirely disappeared, and the patient also recovered from a large carbuncle.

Mr. Cripps believes that dry gangrene, while confined to the toes, may not uncommonly be arrested by proper treatment, *i. e.*, by encouraging the circulation of the limb, and using some dry deodorizer, together with stimulating diet and small doses of opium.

The flaps have sufficient vitality to heal if protected by antiseptic precautions from septic infection, and amputation is the proper treatment when the disease has spread to the foot.

Mr. Cripps does not think it necessary to amputate above the knee, provided that strict antiseptic precautions be adopted.—*Brit. Med. Journ.* 1885. May 9.

A. F. STREET (Westgate on Sea).

II. WRIST-GANGLIONS. By DR. R. FALKSON. He gives fifteen cases (two in postscript) of their extirpation from the wrist. Antisepsis secured perfect preservation of function and, in all but two cases, absolute primary union despite the occasional opening of a tendon-sheath or joint. These ganglia often dip under the carpal ligament, and in the first thirteen, at least, extended to the joint-capsule; although in eleven cases there was demonstrable no communication between ganglion and articular cavity, and very likely none in the others. In the majority of cases the ganglion was more or less adherent to several tendon-sheaths.

Dorsal ganglia come up in most cases between the tendons of ext. indic. propr. and carp. radial. brev. Volar ganglia occur always on the radial half, so that in extirpating them it is at times necessary to tie the radial. He concludes, by exclusion, that these ganglions must develop from either *folliculares synoviales* (Volkman) or subsynovial corpuscles (Henle, Gosselin, Teichmann).—*Arch. f. klin. Chir.* 1885. Bd. 32. Hft. I.

W. BROWNING (Brooklyn).

## Wounds, Injuries, Accidents.

I. THREE CASES OF PISTOL-SHOT WOUND. By RICHARD BARWELL, F.R.C.S. (London).

CASE 1. Shows that conical bullets, fired with great energy cause exceedingly little bruising.

CASE 2. Shows that oblique perforation of a lung, accompanied by much hæmorrhage and followed by hæmo-pneumothorax is not necessarily fatal.

CASE 3. Shows that a bullet may be successfully extracted from a depth of two inches from the margin of the external auditory meatus by means of trephine and gouge six weeks after its entry.

Even when the muzzle of the weapon touches the skin there may be neither burn nor powder-mark. (Report of Transactions of Clinical Society, London).—*Brit. Med. Journ.* 1885. April 4.

A. F. STREET (Westgate on Sea).

## Genito-Urinary Organs.

EARLY SYPHILITIC EPIDIDYMITIS. By Mr. ARTHUR COOPER. A gentleman, æt. 21 years, having contracted syphilis four months previously, and being at the time under mild mercurial treatment, experienced slight swelling and pain in both testicles. There had been no urethral irritation for three years. Mr. Cooper found each globus major uniformly swollen, the other parts being normal. As mercury alone did not produce resolution, iodide of potassium was combined with it, and the swelling speedily disappeared.

This affection would appear at first sight to be more common in France than in England or the United States. Twenty-four cases were recorded by MM. Dron and Fournier, two only are mentioned by Berkeley Hill, Bumstead and Taylor refer to a few others. Probably were the epididymis carefully examined during secondary syphilis the lesion would be more often noticed, for the enlargement is slight and, as a rule, painless. It is important to remember that the globus major is often alone affected, whereas in gonorrhœal epididymitis it is the globus minor which bears the stress of the inflammation. It is interesting to note that the epididymitis came on at the time the patient was taking a mercurial course; the same thing being often seen in the case of secondary iritis, etc.—*Brit. Med. Journ.* 1885. May 30.

J. HUTCHINSON, JR. (London).

II. CALCULUS IMPACTED IN THE URETHRA OR PROSTATE. By L. G. RICHELOT. After touching upon their formation and recommending the bougie à boule in preference to a steel sound for diagnostic purposes, the author points out that there are three distinct methods of treatment open.

1. Direct extraction, limited to calculus in the penile urethra.
2. Pushing back the stone into the bladder.
3. Extraction through an external incision (la boutonnière). Concerning the direct extraction, instead of forceps, which are apt to rend and otherwise damage the mu-

cous membrane, M. Richelot recommends the use of the curette of Leroy d'Etiolles in the way laid down by M. Guyon, viz., the instrument being in situ, a wax bougie is pushed down to the calculus, adapting itself to the irregularities of the stone in such a fashion that it acts as a kind of lithotrite where the female blade is the curette and the male blade the bougie.

In cases where the stone occupies the membranous or prostatic urethra, pushing it back into the bladder should be tried first of all.

A case is related at some length where the author cut down upon an encysted prostatic calculus, and after having broken off several pieces, he succeeded in enucleating the rest of the stone, weighing 20 grammes, which, with the rest of the debris, made a total of 32 grammes. The patient, a young man, æt. 24 years, had suffered with his urinary organs since the age of 7 years. Perinæal lithotomy had been performed at 21 years of age. Death occurred about one month after the operation, and at the autopsy suppurative pyelo-nephritis of the right side, and abscesses in the left kidney were found.—*L'Union Médicale*. 1885. March 1.

III. THERMO-ELECTRIC PROSTATOTOMY. By Prof. BOTTINI (Pavia). A man, æt. 68 years, consulted Professor Bottini for an enlarged prostate. There was mucus in the urine which could only be voided by means of a catheter. Under irrigation of the bladder with solutions of boracic acid and sulpho-carbolate of zinc, the urine became clear and the bladder gained a little power. On July 5, the patient being under chloroform, the professor introduced his thermo-electric cauteriser into the bladder, and applied the canter to the tumor. The instrument consists of a double channeled catheter. Within the inner tube are the isolated electric wires leading down to a platinum plate and heating it when the circle is completed. At the same time a stream of cold water circulates in the space between the two tubes and prevents the surrounding parts becoming heated.

In this case the burning was continued for 45 seconds. No fever followed the operation, and belladonna suppositories were used to relieve vesical tenesmus, a catheter being retained in the bladder.

After four days the catheter was removed, and the urine drawn off every six hours. The bladder was washed out with a 2 % solution of sulpho-carbolate of zinc. Micturition occurred naturally for the first time twenty-four days after the operation, but only in drops to begin with. About this time several sloughs came away in the urine. At the end of three months the act of micturition was normally performed and the urine was healthy. Six months after the operation the patient was in good health. It may be mentioned that great benefit was derived from the administration of nux vomica and the local use of an induced electrical current.

The operation causes but little pain, so that anaesthetics are only useful in hypersensitive patients.—*Gazzette degli Ospitali*. 1885. Feb. 11.

IV. LITHOLAPAXY. By P. T. FREYER, M.D. During the space of two years and six months Dr. Freyer performed litholapaxy 111 times with only four deaths; two being due to exhaustion, one to peritonitis, and one to pyæmia.

The calculi removed varied in weight from 5 grs. to  $3\frac{1}{4}$  ℥. There were fifty weighing ℥ss and upwards; twenty-seven, 1 ℥ or more; seven, 2 ℥ and upwards, and two over 3 ℥.

The debris of the largest stone crushed weighed  $3\frac{1}{4}$  ℥, and was composed of uric acid. It occurred in a man, æt. 60 years, who had suffered with symptoms of vesical calculus for eleven years. The operation lasted sixty-six minutes, and the patient made a rapid recovery. Several patients of 80 years and over had large calculi removed successfully. In one case the subject was 96 years old, and the operation lasted one hour.

The author lays great stress upon the operation being completed in one sitting. He finds that old patients bear the operation much better than young men, and it is less likely to be attended with urinary fever.

Dr. Freyer agrees with Bigelow in the use of a large fenestrated lithotrite for large stones, and the employment of the largest canula that will pass with ease into the bladder. The larger the evacuating tube the less necessity there is for completely pulverizing the calculus; consequently, the more expeditious is the operation, a matter of importance where the stone is a large one and the patient worn out with much suffering. Again, small multiple calculi may often be removed through a large evacuator, without any crushing at all.

Finally, the author prefers the term of litholapaxy for this operation, as indicating a distinctly new procedure.

For males below puberty lithotomy is certainly the operation of choice.

Out of 132 cases of this operation in the author's hands, there was no death.—*Lancet*. 1885. March 7—14. F. S. EDWARDS (London.)

V. CONTRIBUTION TO THE OPERATION FOR VESICAL CALCULUS. By Prof. von DITTEL (Vienna). In a couple of articles early last year von Dittel brought the number of his calculus operations up to 350. In the present series of articles he gives fifty more, making a total of 400; besides sundry remarks on the relation of litholapaxy to suprapubic lithotomy—Sixty-nine cases of lateral incision, twenty-two of median, thirteen of suprapubic, 179 lithotripsies and 117 litholapaxies. The lateral operations and the lithotripsies were all included in his first 300, the litholapaxies in his last 300. The *sectio-alta* he has done five times for other purposes, making a total of eighteen suprapubics. Volkmann considers litholapaxy unsuited to our aseptic era; with this Dittel does not agree—except for those who have not the opportunity to acquire sufficient skill and confidence. Moreover, he is convinced that intelligent patients, *i. g.*, physicians suffering from calculus, prefer litholapaxy. In this operation the cure is also more rapid. Even with the greatest care, however, according to Dittel's experience, Bigelow's operation does not insure against relapse, but neither does the suprapubic operation invariably. Fragments may remain or an entirely new calculus develop. He gives the following case:

In a man who had been repeatedly examined by himself and others with a negative result, he at length, under narcosis, found a stone. This was cleaned out Dec



30, 1882. On May following he had to do litholapaxy again. Trouble began again soon. Median operation in October when he found five concretions the size of a pigeon's egg behind the enlarged prostate. A few months later it set in anew; operated through old cicatrix. Several small concretions besides a  $3 \times 2\frac{1}{2}$  centimetre stone. This time, as before, careful examination of the bladder with the finger. Relief at first, but only for six weeks. Operated once more, May, 1884, removed a phosphatic stone  $3\frac{1}{2} \times 3 \times 2\frac{1}{2}$  centimetres around a bit of cotton. How this came into the bladder could not be determined.

He considers the suprapubic the most perfect operation. Preliminary injection of the bladder has, however, twice in his experience led to rupture of a bladder diverticle. For the removal of certain foreign bodies, not otherwise extractible, he prefers the median operation. He decidedly opposes suturing after the high operation. In Nos. 23, 24, 25 and 26 his last fifty cases are carefully tabulated.—*Wien. Med. Woch.* 1885. Nos. 19 to 26.

VI. GALACTOCELE OF TUNICA VAGINALIS TESTIS. By Dr. HASHIMOTO (Tokio). A peasant, æt. 28 years, said to have suffered a contusion of scrotum four years previously, but without immediate pain or enlargement. Five days later some pain on walking and first swelling of scrotum, which has gradually assumed a large size. Scrotum now  $32\frac{1}{2}$  centimetres long by 22 centimetres in circumference. It looked like a hydrocele. Drew off a little whitish-yellow, milky, not transparent fluid, which showed fat droplets under the microscope, but no filia. Punctured then with trocar; 350 gm. fluid removed; iodine injected. Not seen again.—*Arch. klin. Chirg.* 1885. Bd. 32, Hft. I.

VII. CONTRIBUTION TO THE QUESTION OF THE ORIGIN OF BILOCULAR HYDROCELE. By Dr. O. WITZEL (Bonn). The clinical history and method of treating hydrocele bilocularis abdominalis are satisfactorily understood, not so its origin and pathological anatomy. There is one available post-mortem examination, that of Lister. The most generally accepted and yet rather incongruous view is that, despite the relatively small resistance against extension downwards, and despite impediments, abdominalward, a scrotal hydrocele leads to a dilatation of the processus vaginalis as far as the internal inguinal ring and elevation of the peripheral peritoneum with the formation of a larger secondary abdominal tumor. Trendelenburg, a couple of years since, pointed out the improbability of this explanation, and indicated the probability of the sac being perforated, also a possible connection between this and retained testicle. W's case bears out Trendelenburg's views.

A man, æt. 42 years, was admitted on account of a large swelling in the left lower abdominal region. Corresponding testicle wanting. Three years previously he first noticed a swelling in the left groin. A truss was at first worn. In the last six months rapid increase in size. The pear-shaped tumor lay obliquely, its broad end outward as far as the spina ant. sup., reaching upward to within two finger breadths of the umbilicus and to the right over the median line. Fluctuation. A conical

process extended into the left scrotum was about the size of a goose egg, compressible, and became tenser on coughing. A bilocular hydrocele was diagnosed. The occurrence of deep pain of late, and the absence of left testicle indicated possible malignant degeneration of said organ. Radical operation: Long incision parallel to Poupart's ligament. About 1 litre of brown-red clear fluid discharged. The sarcomatous testicle, size of fist, was narrowly attached to rear wall of sac; the latter was lined with serous membrane. Three pouches or recesses branched off; one posteriorly along the spermatic cord, one in inguinal canal, and a third toward the median line without any physiological analogue. Contra-opening in left scrotum for drainage. Cured in three weeks.—*Cent. f. Chirg.* 1885. No. 27.

W. BROWNING (Brooklyn).

VIII. NEPHRECTOMY, ITS INDICATIONS AND CONTRAINDICATIONS. By Dr. S. W. GROSS (Philadelphia). An analytical study of nearly four hundred and fifty cases of different operations on the kidney. The following conclusions are formulated:

1. That lumbar nephrectomy is a safer operation than abdominal nephrectomy.
2. That primary extirpation of the kidney is indicated; first, in sarcoma of adult subjects; secondly, in benign neoplasms at any age; thirdly, in the early stage of tubercular disease; fourthly, in rupture of the ureter; and lastly, in ureteral fistula.
3. That nephrectomy should not be resorted to until after the failure of other measures; first, in subcutaneous laceration of the kidney; secondly, in protrusion of the kidney through a wound in the loin; thirdly, in recent wounds of the kidney or of the ureter, inflicted in the performance of ovariectomy, hysterectomy, or other operations; fourthly, in suppurative lesions; fifthly, in hydronephrosis and cysts; sixthly, in calculus of an otherwise healthy kidney; and, finally, in painful floating kidney.
4. That nephrectomy is absolutely contraindicated; first in sarcoma of children; secondly, in carcinoma at any age, unless, perhaps, the disease can be diagnosed and removed at an early stage; and, thirdly, in the advanced period of tubercular disease.—*Am. Journ. Med. Sci.* 1885. July.

## Ulcers, Abscesses, Tumors.

I. THE PATHOLOGY OF RODENT ULCER. By F. T. PAUL, F.R.C.S. Mr. Paul classifies the different opinions concerning the true nature of rodent ulcers as follows:

1. As a variety of epithelioma—Moore, Collins, Warren; and as depending on the nature of the soil in which it grows—Hutchinson.
2. As a carcinoma of the sebaceous glands—Thiersch, Butlin, and others.
3. As a carcinoma of the sweat glands—Thin.
4. As a carcinoma of the hair follicles—Tilbury & Calcott Fox, Sangster & Hume.

The paper is based on the microscopical examination of twenty-two cases placed in the hands of Mr. Paul.

He assumes it to be generally admitted that rodent ulcer is a carcinoma of the skin; but to decide whether it is to be regarded as a carcinoma of the entire skin, or only one of the dermal appendages; and, if the latter, whether it is always an atypical growth of the same appendage, or whether it should be subdivided into carcinoma of each variety of appendage, he treats the subject under the following heads:

1. The minute structure of the growth.
2. What normal skin elements or other skin growths show any relationship to this.
3. Whether it has any special affinity for, or tendency to spread in, one particular skin structure rather than the rest.
4. Whether its remarkable localization to the skin of the face bears upon its origin.

5. Whether any microscopical evidence can be obtained as to its earliest formation—that is, the primary growth, not the marginal increase.

1. Rodent ulcer presents remarkable variability of growth, and it would almost seem as if few cases resembled each other, nor do they entirely, but there is a subtle uniformity of type traversing most of these varieties, which enables a practiced histologist to at once recognize the nature of the growth under the microscope.

2. Amongst all the carcinomata, rodent ulcer shows the least striking resemblance of any of them to a normal tissue. Rodent ulcer may be described as a carcinoma of the skin, showing very abortive attempts in its evolution towards the development of the dermal appendages.

3. Under the head of minute origin, Mr. Paul considers that what evidence there is points in the direction of its probable origin in the skin as a whole, and does not tend to associate it with any particular dermal appendage.

4. The localization of rodent ulcer and skin-adenomata on the face, he considers to be very strong evidence in favor of associating the origin of rodent ulcer with the glands of the skin.

5. In the smallest growths which he examined, some, even before ulceration had commenced, yielded no evidence of their minute origin, since in all of them the growth had gone entirely over to the cancerous stage.

Mr. Paul finally states his opinion that rodent ulcer is a chronic form of carcinoma of the skin, rather than a carcinoma of any special dermal appendage.

1. Because its structure varies greatly, and because in normal development the rete malpighii produce very various epithelial structures.

2. Because there are to be seen appearances in the minute structure of certain rodent ulcers, which resemble some points in the evolution of the several dermal appendages.

3. Because, also, there are points of resemblance between certain rodent ulcers and the innocent epithelial growths of the skin.

4. Because the general arrangement and type of the growth is like slow-growing epithelioma.

5. Because it passes insensibly into epithelioma.

6. Because its minute origin, so far as it can be surmised, is the same as in epithelioma.—*Brit. Med. Journ.* 1885. May 2. II. H. TAYLOR (London).

II. PARANEPHRITIC ABSCESS. By Prof. H. FISCHER (Breslau). All suppurations occurring in the tissues surrounding the kidney outside of the peritoneal cavity, are included under the term paranephritic. The disease is rare; it occurs more frequently in males, usually unilaterally, during middle age, and quite frequently in cases of abnormally developed kidneys.

*Primary Paranephritic Abscess* originates in the connective tissue immediately surrounding the kidney. It is analogous to phlegmon in other parts, and can be experimentally produced in animals. In man these abscesses are generally quite extensive, and the pus is under considerable pressure; they are situated between the diaphragm and iliac fossæ at the lateral terminus of the quadratus lumborum muscle.

The etiology comprises contusions in the region of the kidneys, and other mechanical injuries, penetrating wounds—especially bullet wounds, and sudden or repeated exposures. After acute infectious and septic diseases paranephritis has been repeatedly observed, and actinomycosis is undoubtedly a cause of recurring abscess in the lumbar regions.

The symptoms consist of pain in the back—generally constant in character and increased by direct pressure, by movements, coughing, etc., and sometimes radiating downwards; in a flexed position of the thigh, as in coxitis, and in shooting pains, neuralgia, anæsthesia, or even paralysis of the lower limb. A stiffness of the spinal column is the consequence of voluntary muscular action.

Fever is always present, generally continuous, with evening elevations, but frequently accompanied with rigors; or it is hectic in character, especially in the later stages. Debility, loss of appetite, vomiting and constipation are complained of. The urine shows no change; occasionally slight albuminuria, or even retention has been observed. (Edema of the lower extremities, or even ascites as well as dyspnœa and cyanosis, caused by the impeded action of the diaphragm, occur.

At the end of the second week a tumor may be noticed in the lumbar region, and may be felt from the front in narcosis. Later on the skin becomes involved in the inflammation, and thick, yellow pus may be obtained by paracentesis.

If these abscesses are not absorbed in the course of the disease, they may either perforate the skin of the back and discharge, or they may perforate the renal pelvis and the pus pass into the bladder. They may also perforate into the other organs—the pleuræ, the intestines, the liver, the lungs or the peritoneum, either into one or more simultaneously; or they may infect these organs by the pus being conveyed to them through the interstices of the connective tissue and produce suppuration.

Finally, these abscesses may tend to burrow downwards, most frequently along the

psoas muscle, or into the iliac fossa, and from there to the thigh or into the hip joint; very rarely do they descend into the lowest parts of the pelvis, or reach the bladder, the urethra or the scrotum.

*Secondary Paranephritic Abscess* is caused by infection from inflammations and suppurations in neighboring parts, either by perforation or by contact alone.

They may be due to purulent pyelonephritis caused by gravel, *strongylus gigas*, or by so-called surgical kidney (resulting from disease of the genito-urinary organs), and, perhaps, by action of cold; or to primary purulent nephritis and abscess of kidney, to tuberculosis or cheesy nephritis (nephro-phthisis), or, but very rarely, to suppuration of kidney-tumors and, probably, also to renal actinomycosis. Each of these possibilities is the subject of detailed consideration by the author.

*The Diagnosis* of paranephritis from empyema is facilitated by the thorax not being distended, the heart and liver not being displaced, and the signs of intrathoracic pressure not being recognized. Muscular rheumatism and tumors of the kidneys are not accompanied by fever. Abscess of the liver causes icterus and partakes of the movements of the diaphragm. Splenic tumors show an easily recognizable shape and abscess does not occur. Suppurating ovarian tumors lie in front of the intestines, are movable, and characteristic in form and appearance. Cysts are very rare in the para-renal tissue and may be diagnosed by aspiration. Similarly hernia should be borne in mind; they are rare, situated in the trigonum Petiti, and are easily replaced.

Of the various methods to enable one to estimate the condition of one kidney, when the other is known to be diseased, the author gives preference to Silbermann's, consisting in the introduction of a specially constructed catheter into the bladder and filling the attached rubber bulb with mercury so as to occlude one ureter, while examining the urine flowing from the other.

Complications of paranephritis are tuberculosis and amyloid degeneration; intestinal ulcerations have likewise been observed.

The prognosis of paranephritic abscess is not so bad—if timely surgical aid be procured. That of secondary abscess is, of course, the same as that of the primary disease. Death may occur through marasmus, uro-sepsis, pyæmia or uræmia.

*The Treatment* must meet three distinct indications: The development of paranephritic abscess should be prevented, discutient means should be employed in the first stages, and, as soon as an abscess has been ascertained to exist, surgical interference is called for.

Stones, when diagnosed, should only be removed from the kidney when hæmorrhages or severe attacks of renal colic seriously endanger the health of the patient. The author recommends a lumbar incision, opening the renal pelvis and carefully extracting the stone. He is not in favor of extirpation of the kidney for purulent pyelo-nephritis, but prefers nephrotomy, and only in case that this operation brings no relief, does he advise nephrectomy, and in this case, a long incision reaching from the lowest rib to the os ilii on the outer edge of the quadratus muscle, without resec-

tion of ribs. In case the capsule cannot be extracted, it is well to leave it, only enucleating the kidney.

If the kidney be found entirely degenerated, forming only a sac filled with pus or gravel, he advises suturing it to the wound and incising it.

Wounds of the kidney should be treated expectantly as long as possible, extirpation being only resorted to when suppuration has totally destroyed the organ. In cases of surgical kidney, where both kidneys are usually simultaneously affected, as well as in tuberculous disease, no severe operations should be undertaken.

Malignant tumors of the kidney should be removed from the front by abdominal section.

The second indication, the author believes, can not be successfully fulfilled; he, therefore, uses hot applications as soon as an abscess is diagnosed.

The operative treatment of an abscess fairly established must be begun as soon as possible. An incision is made six or eight centimetres from the spinal process, commencing a little below the twelfth rib, and the sac opened, the aperture being enlarged with blunt instruments or with the finger to prevent hæmorrhage, this method being preferred, generally speaking, to aspiration. In cases of downward burrowing of pus or secondary suppurations and empyema, these abscesses should be opened at the same time.

Fistule are frequently very difficult to heal definitely.

The treatment of secondary paranephritic abscess is included in that of the primary cause.

Nephrectomy may come in question here, as well, but should not be performed at the same time as the opening of the abscess, but at a later period.—Volkmann's *Sammlung klin. Vorträge*, No. 253. 1885. May 27.

III. CONTRIBUTIONS TO THE PATHOLOGY OF TUMORS. By Prof. F. WILH. ZAHN (Geneva).

1. The first of this series of papers on the<sup>2</sup> subject of tumors treats of *multiple myeloma*, its proper classification and its relation to lymphatic anæmia. A case is given of a laborer, æt. 62 years, who presented deformities of the thorax, with tumors, and fractures of the ribs, and anæmia, general debility and emaciation, and who was treated at the Geneva Hospital under the care of Professor d'Espine for osteomalacia, at different times, during a period of five months. The post-mortem revealed multiple primary osseous tumors, some of which were situated at the places of fracture, most all the ribs and the sternum being fractured, and the spinal vertebrae softened. The internal organs were healthy, the lymphatic glands not enlarged. The urine was normal, as was also the blood.

The disease is due to an alteration in the marrow of the bones, resembling in nature the soft lymphosarcoma of Virchow.

Only two similar cases are reported in literature: One by von Rustitzky, and one by H. Buch, extracts from which are given. The former speaks of the tumors as myeloma; believes them to be non-malignant in character, representing simple hy-

pertrophy of the bone marrow, while the latter calls his case one of multiple sarcomatosis of the bones. The author, however, considers the tumors malignant in character, although multiple in their occurrence from the outset, and believes them analogous to the lymphosarcoma of the lymphatic glands and of the spleen.

The disease may be diagnosed *intra vitam* by means of the painful osseous swellings associated with general anæmia.

The author further adds three cases of lymphatic tumors, two published by Lannelongue and Rich. Schulz respectively, and one of his own, and concludes, after comparing them with his first case in question, that these latter ones represent the mixed form of pseudo-leucæmia, being associated with swellings of the lymphatic glands and tumor of the spleen, together with changes in the marrow of the bones, but that his first-mentioned case differs from these only in the absence of the splenic and lymphatic tumors—the alteration in the bone-marrow being in both cases the lymphosarcoma of Virchow.

The etiology is unknown. No bacteria were found. The anæmia is referred by the author to some inhibitory influence upon the development of the red blood-corpuscles due to the exuberant growth of the lymphatic elements.

2. The second paper, on a case of *primary sarcoma of the seminal vesicles*, illustrating at the same time a singular mode of metastasis of tumors, forms a valuable contribution to the latter subject.

Tubercle and carcinoma of the seminal vesicles being considered to be always secondary, the author publishes this case with very careful pathological anatomical notes. It relates to a gentleman, æt. 76 years, who was under observation for only eighteen days. He had no fever, except on admittance, when he complained also of pain in the lower limbs; his urine was normal, although he could not pass it freely, but only by constant dripping. There was no history of syphilis, and he had always been regular in his habits.

The post-mortem revealed sarcomatous tumors of the heart, the mesentery, the intestine, the renal pelvis and the right seminal vesicle, encroaching on the left one and on the prostate.

The latter tumor, in the author's opinion, is the primary one, because no metastases were found in the liver, and secondary metastatic tumors are not found in the seminal vesicles; moreover, the manner in which the left seminal vesicle and the prostatic gland were affected, as well as the presence of thromboses in the immediate vicinity, point to the primary affection of the right vesicle.

The fact that no metastases were found in the lungs is accounted for by the author by the presence of pulmonary emphysema, a tricuspid insufficiency and a persistence of the foramen ovale.

3. The author next describes *two tumors of the tongue*, occurring in a man æt. 40 years. The specimen having been accidentally found at anatomical dissection. Nothing is known of the clinical history of the case; no other tumors of the body had been found.

Each tumor measured about 15 millimetres in diameter, was round in shape and situated on the lateral edge of the back of the tongue. They consisted of fibrous tissue tending towards sclerosis, so that one was partially ossified; the surrounding connective tissue had become metamorphosed by hyaline and amyloid degeneration, perhaps, as a consequence of local impairment of nutrition. The case is compared with two others recently published.—*Deutsch. Zeitschr. f. Chirg.* 1885. May. Bd. 22. Ifit. I and II.

IV. ON THE OCCURRENCE OF CANCER OF THE RECTUM IN THE FIRST TWENTY YEARS OF LIFE. By Dr. G. SCHÖNING. While assistant at the Surgical Clinic of Rostock, the writer had an opportunity of observing two cases of cancer of the rectum occurring in young persons, which he publishes on account of the rarity of such cases in literature.

The first case was one of a girl, æt. 17 years, whose family was healthy. In her seventh year she suffered from rectal prolapse. In her sixteenth year the passages were bloody for about a month, and three months later constipation set in with occasional slight hæmorrhages. Two months later the dejecta became watery and were not under voluntary control. She was admitted to the hospital two months afterwards, in feeble condition, and complaining of pain in the abdomen and loss of appetite. The typical symptoms being found on examination, the diagnosis of rectal cancer was made; the upper terminus could be reached with the finger at the back, but not in front. Six days later the operation for extirpation of the rectum was performed. Some hæmorrhage occurred owing to the tumor adhering to the sacral bone; the peritoneum was not opened, however, nor was the vagina or the bladder injured; the intestine was drawn down and stitched to the wound, a piece, 10 centimetres long, having been excised. In the further course of the case, retention of urine occurred, a purulent cystitis set in; on the twelfth day a piece of the rectum, 6 centimetres wide sloughed off, and ultimately stenosis of the anus supervened.

Nearly two months after the operation coma and convulsions suddenly set in and death ensued, due, as the post-mortem showed, to uræmia caused by the impaction and compression of the ureters in the recurrence of the tumor. The microscope revealed a typical carcinoma.

The author believes that in the seventh year the patient suffered from adenoma, which subsequently turned into carcinoma, which developed in ten months.

The second case was also a girl, æt. 17 years. No heredity. Constipation occurred six months before admission, increasing subsequently. One month later the anal opening became callous, and after five months a growth was seen on the nates by the patient's sister. On admission to the hospital a tumor could be felt of the size of a man's fist, very hard, and encroaching on the pelvic organs, and affecting the inguinal glands. As the tumor could not be removed, the constricting tissues were divided; a portion removed proved the tumor to be an alveolar cylinder-celled carcinoma, partly undergoing cystic degeneration.

Subsequently, fever obtained, the tumor increased and ulceration set in.

Death occurred four months after admission, although not in the hospital.



In this case, the author believes, the tumor began to develop in the sixteenth year. Although it apparently took rise from the skin, yet the presence of cylinder-cells point to the rectal mucous membrane as the origin of the growth.

In addition to these two cases the author reviews five other similar cases already published, excluding all uncertain ones, and adduces statistical information from various authors.

As to etiology, the author inclines to Cohnheim's theory, believing that at the embryological period of union of the rectum and the anus, clusters of epithelial cells become disseminated and develop later by themselves.—*Deutsch. Zeitschr. f. Chirg.* 1885. May. Bd. 22. Hft. I. and II. W. VAN ARSDALE (New York).

V. CYSTIC TUMOR OF THE JAW. By A. C. BERNAYS, M.D. (St. Louis). Relates a case, with illustrations, of cystic tumor of the lower jaw occurring in a negro man, æt. 20 years. The affected portion of the jaw was successfully removed, and the defect, remaining after healing, was very satisfactorily supplied by a dental prosthetic appliance. The author reviews the literature of such cases, and details the results of his own microscopic investigations into their pathological histology. He concludes that they are of epithelial origin, and that they originate from remnants of embryonic enamel germs, and only rarely, if ever, from epithelial ingrowths occurring later in life. He proposes the term, "Enamelogenous Cysts," in the place of the numerous names heretofore used to designate these tumors.—*The Med. Record*, 1885. July 4.

VI. OSTEO-SARCOMA OF CLAVICLE—REMOVAL. By M. POLAILLON. A previously healthy girl, æt. 16 years, came under M. Polailon's care for a tumor, evidently involving the right clavicle. It had been noticed for eighteen months as a painless swelling. There was no family history which could throw light on the case. The tumor was as large as one's fist, protruding chiefly upwards and backwards. There were no symptoms of pressure on the vessels or nerves, and but little impairment of movement except that of elevation, any sudden movement, however, was painful.

January 29, 1885, the tumor was excised with the bone by means of a horse-shoe incision running from the outer border of the sterno-mastoid to the acromion, and then over the supra-spinous fossa. There was no great bleeding or other difficulty about the operation, which was done antiseptically. In a fortnight's time the drainage-tube was removed, and the wound healed very rapidly. The shoulder remained slightly depressed and flattened, but the movement was intact.

(M. Tillaux (*Anat. Topogr.*), mentions a case of a Paris waiter who had a false joint in one clavicle, and in whom not the least impairment of movement existed).

The tumor has not yet been examined, but the further history of the case (which I am enabled to give through the kindness of M. Polailon) leaves little doubt as to its nature. The growth involved the outer half of the bone, and, although the outer three-fourths with the surrounding tissues were removed the patient presented himself with a recurrence beneath the scar at the end of May. June 4, M. Polailon re-

moved this together with the coracoid process, the acromion and a further piece of the clavicle. The patient has at present done well.—*Gaz. Med.* 1885. April 4.

J. HUTCHINSON, JR. (London).

VII. TRAUMATIC ANEURISM OF AXILLARY ARTERY; LIGATION OF SUBCLAVIAN; RECOVERY. By L. S. McMURTRY, M.D. Male, æt. 30 years. Pistol shot in right shoulder. Gradual development of swelling in axilla, which at the end of thirteen months was size of a newly-born child's head. Disability of limb from pressure on brachial plexus. Subclavian artery ligated in the third part of its course. Silk. Ligature came away on twenty-first day. Prompt healing of operation wound. Six months later the tumor remained, large and elastic, causing disability of limb. Scar incised after ligation of axillary below tumor. Cavity cleansed of clots and drained. Rapid recovery. The author calls attention to the statistics of Mr. Erichsen, who cites eight cases of axillary aneurism arising from stab or gun-shot wounds which had injured the external tunic of the axillary artery, in which the subclavian had been tied, without a single fatal result.—*Journ. Amer. Med. Assoc.* 1885. July 11.

## Bones, Joints, Orthopedic.

I. MULTIPLE FRACTURE IN A SYPHILITIC WOMAN. By M. L. PICQUÉ. The patient, a woman, æt. 57 years, was admitted into the Hôtel Dieu for a fracture of the neck of one femur ( $1\frac{1}{2}$ " shortening, eversion, swelling, etc.), caused by a fall due to her tripping up.

The tibia of the same side had been broken two years before (also through a fall), and had well united. In the outer third of one clavicle there was said to be a false joint—due, she said, to her leaning her weight on the arms. There had been little pain about it, and no treatment had been adopted, except for "rheumatism." There was no history of syphilis, but she had an ulcer on the forehead which exposed bone and was said to have followed a small lump there two years before.

M. Picqué attributes the fracture to "a syphilitic diathesis" or to "syphilitic osteomyelitis gummata." This case hardly seems a strong one—for setting aside as somewhat doubtful the lesion of the clavicle, there is nothing unusual in a fracture of one femoral neck at 57 years of age, preceded by a fracture of one tibia at 55 years of age.

The author refers to a recent article on syphilitic lesions of bone and their influence on fragility, by M. Gangolphe, but the latter adduces little that is new, so far as we have seen. He believes that there is always a local gumma, etc. (and not mere rarefaction) at the seat of fracture. For a fracture of the clavicle (just beyond the sterno-mastoid) by muscular action—cracking a whip—see *Gazette Médicale*, 1847, p. 618. The patient was a healthy-looking man, æt. 47, who had had syphilis. A more interesting case occurred a few years ago at one of the London hospitals. A man broke one clavicle in raising his child from the ground, and at the seat of fracture was found to be a considerable swelling which was diagnosed to be a malignant tumor. The bone was excised and the supposed tumor proved to be gummatous.

The patient, fortunately, recovered quickly, and had a very useful arm. M. Venot, in the *Gazette Médicale* of 1847, mentions the case of a woman who, whilst under treatment for severe tertiary syphilis, broke one clavicle as she moved her arm quickly behind her back. M. Venot gives two other cases of fractures in syphilitic patients, but as to the relation between the two the reader must form his own opinion. A man, æt. 24 years, suffering severely from acquired syphilis, broke one patella in the act of simply getting into bed. Iodide of potassium and the usual means of adjustment obtained close union. The other case was that of a woman, æt. 27 years, who, being in the hospital for syphilis, had one femur broken by the attendant resting her hand on it—"it snapped like glass." No repair followed, and she died in coma three weeks later. At the post-mortem it was found that the ribs and bones of the forearm would break on the slightest force being used.—*Gaz. Méd.* 1885. May 2.

II. • PERIOSTITIS FOLLOWING TYPHOID FEVER. By Dr. KING. PERIOSTITIS DURING TYPHOID FEVER. By Dr. AFFLECK. The distinction between these two titles is obvious. The first case agrees with those described by Sir J. Paget (*Clinical Lectures*, 1879, p. 397) in occurring during convalescence from the fever which had lasted eight weeks in an artisan, æt. 29 years. The right tibia was the bone affected. There was much swelling and pain along the whole leg. An incision was made and a drainage tube inserted, but though the symptoms seemed markedly relieved by these measures, there is no evidence as to the presence of suppuration or of threatened necrosis. In three weeks the part was almost well. It will be remembered that Sir J. Paget (and in this M. Mercier agrees with him) deprecates the use of incisions, especially when the ribs are the bones affected, but both admit that necrosis may follow in the case of other bones. Paget says he has not observed periostitis to occur except during convalescence or later, but Dr. Affleck's three cases were all noticed during the fever; two in the third week, the other in the fifth. The tibia was alone affected in one. The tibia and humerus in another, the humerus alone in the third. Spontaneous resolution occurred in two cases (after a considerable time had elapsed), but an abscess formed over the humerus in one and required evacuation. It would seem advisable in these cases to relieve tension and pain by an incision, using full antiseptic precautions.

Dr. Affleck has seen periostitis follow typhoid more frequently than "swelled leg," his three cases occurred in a total of 117 treated at the Edinburgh Infirmary.—*Brit. Med. Journ.* 1885. May 9. J. HUTCHINSON, JR. (London).

III. FOUR CASES OF SUPPURATION AFTER BRISEMENT FORCÉ. By Prof. M. OBERST (Halle). As to the ultimate fate of specific disease-germs in the body there are three possibilities:

1. They may be thrown off in excretions, pus, etc.
2. They may perish in the body or form products fatal to themselves, as is the case with bacteria of alcoholic fermentation and of putrefaction.
3. They may remain dormant in the body, in which case there is danger that,

sooner or later, conditions will become favorable for their developing into fresh activity. In this way, perhaps, we have to explain the latency of tubercular epiphyseal deposits for years, when they suddenly, *e. g.*, after slight traumatism, start up anew at points where the former trouble had long since subsided. The like occurs after acute infectious osteomyelitis, a typical relapse appearing years after the usual time of life.

He thus classes several unfortunate cases of brisement forcé.

1. Woman, *æt.* 26 years. Three years before, fever, severe pain in joints, etc., leading to stiffness and deformity. Extension, massage, baths, etc., achieved little. Forcible correction of position of the left ankle, knee, elbow and wrist joints. Not the least injury to integument. Fever began same day. Large abscesses, containing fetid pus, formed about upper end of left femur. Extensive blood extravasations about left elbow. Death from exhaustion six weeks after brisement. Autopsy showed a fracture of the left femur a few inches below trochanter, and an osteomyelitic sequestrum, also other osteomyelitic abscesses in same bone.

2. Girl, *æt.* 19 years. Attacked four and a half years before with typical osteomyelitis of left tibia. Both legs said to have early assumed a bad position. Suppuration continued three years. At present, dislocation of right hip, ankylosis of left knee, etc. Forcible extension of knee, skin not injured. Next day fever, then pain in left knee extending into the thigh and swelling of same region. Abscess opened six weeks after the operation; pus hæmorrhagic but not putrid; bone bared of its periosteum. It became necessary to amputate left thigh. Cure by first intention.

3. Man, *æt.* 21. In 1875, and twice in 1876 rheumatic attacks affecting nearly all the joints of the extremities and leaving severe deformities. No joint suppurated. Only the ankle-joint could be broken up. Cracking and snapping sounds indicated that bone may have been fractured and broken. On the sixteenth day increasing pain in right foot, and fever. On removing plaster bandage phlegmonous swelling and fluctuation below internal malleolus. It healed out three weeks after incision.

4. Man, *æt.* 23 years. Acute, painful febrile swelling of right knee. Relapse. Ankylosis. Brisement seven months after commencement of the trouble; skin preserved intact. Severe pain and fever next day. Suppuration. Incision. Cure. Microscope and cultures showed only the yellow pus staphylococcus.

He advises great caution in the forcible breaking up of ankyloses from acute infectious troubles. He has not met with similar mishaps on stretching apparently cured tubercular joint affections.

## REVIEWS OF BOOKS.

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FACE AND FOOT DEFORMITIES. By FREDERICK CHURCHILL, C. M., Surgeon to the Victoria Hospital for Children. With illustrations of new appliances for the cure of birth-marks, club-foot, etc. Philadelphia: P. Blakiston, Son & Co. 1885. Small octavo, pp. 195.

The reader will be at once struck by the very peculiar title of this book. The author, recognizing this fact in his preface, apologizes for its indefiniteness, and then enters into an explanation which is, if anything, still more indefinite, upon some points, than the title itself. In summing up his definition of the word deformity, he states that "A deformity, in fact, is anything that is manifestly ugly or crooked." In this, sense, therefore, he includes and treats upon birth-marks, congenital growths, *nævi* and eruptions of the more common kind as they appear upon the face. Surface neoplasms, such as lipoma and epithelioma, together with salivary fistula and dental abscess, receive a fair share of attention. The most frequently met with injuries of the face, including incised wounds, some fractures of bones and burns and scalds, and the removal of cicatrices occupy section III. Section IV. comprises plastic surgery, particularly of the nose and lip. Section V. is made up of deformities of the lips other than harelip. Section VI. is devoted entirely to the eye, and, as one can well imagine, when it is kept in mind that the author's experience is derived largely from the wards of a metropolitan hospital devoted to the care of sick children; this section comprises the greatest variety and extent of diseases. This is followed by a section comprising deformities of neurotic origin.

In the portion of the book devoted to foot deformities, the same general plan is followed, injuries and surface deformities taking precedence; these being followed, in their turn by a section devoted to deformities resulting from badly fitting boots, a subject, by the way, of late sadly neglected by writers of systematic treatises upon general surgery. The author takes up the cudgel against the prevailing fashion of making the foot fit a ridiculously shaped shoe, instead of making the shoe fit a natural foot. The last section treats of congenital and paralytic deformities, and treats mainly of club-foot in its different varieties.

In the first section, the author mentions a device of his own for the systematic obliteration of that hideous deformity known as port-wine mark, as it occurs upon the face. He first prepares the skin by hardening it (how he does not say), and then spreads a coating of collodion over the portion of the growth which he proposes to destroy. The object of this latter is likewise not stated. He then places a thin metal plate perforated with holes about an eighth or a sixteenth of an inch apart, and the holes, presumably, of the same diameter as the width of the spaces, upon the portion of the growth to be operated upon. Through the perforation in the metal plate he makes rapid punctures with a needle cautery into and through the skin. By this means minute dot-scars, as they might be called, take the place of the destroyed blood-vessels constituting the port-wine mark. These latter scars, in time, he asserts, come to resemble the sebaceous puncta in sweat pores in the natural skin. The advantage of the metal plate in thus guiding accurately the needle cautery in the equi-distant distribution of the punctures, is at once obvious, when the effect sought to be attained is considered. This "stippling" process, as the author designates it, is done by a fine Paquelin cautery point. I have described it at some length for the reason that it is one of the "new appliances" for the cure of birth-mark to which attention is called upon the title page.

When speaking of fractures of the nasal bones, in section III. there is a disposition evinced to cling to the old-fashioned pads, strapping and bandages to retain the fragments in position after replacing the latter. Nothing, in our opinion, can be so simple, and withal so effectual as the neat device originating with L. D. Mason. This consists in passing a fine drill transversely beneath the fragments, after elevating and replacing them, and passing in the drill track a coarse needle, or the drill itself may be left in situ. The ends of the drill or needle are left projecting about a quarter of an inch, and over these projecting ends are passed the two extremities of a narrow strip of elastic webbing, pure gum rubber, or, in the absence of either of these, a strip of adhesive plaster snugly applied. Thus, it will be seen, the fragments are supported from behind, laterally, and from before backwards. After the lapse of sufficient time to insure firmness of union, the needle or drill constituting the posterior support is withdrawn. This method has been before the profession for several years, and one may well express surprise that its advantages are not well enough appreciated to at least merit mention in a work purporting to limit itself to "modern methods of treatment." If there were as many apparatuses for the treatment of fracture of the nasal bone as there are for broken clavicle—and further, if the former gave as good results without any dressing what-

ever as the latter, the omission of any particular method would be entirely excusable. But, unfortunately, such is not the case; the same old stock advice is given in this class of cases and, much to our discredit it must be said, about the same average result is obtained when such advice is followed. That is to say, under such treatment as our author advises, it is a very rare thing for a person, who has suffered a fracture of the nose, to possess afterwards that organ in all its pristine shape and beauty. With Mason's method, all this is now changed.

A deflected septum will sometimes give rise to a very decided surface deformity of the nose. The nearest our author approaches to mentioning this rather common deformity is when he speaks of the "Alæ being collapsed and lying against the septum." One would hardly recognize, in this sentence, a description of a deflected septum with occlusion of one nostril and a correspondingly increased patency of the other.

In speaking of the treatment of nævi not involving the skin, no mention is made of the application of the elastic ligature. Surely the latter is modern. Again, in the paragraph upon chancre of the lip, he advises that it be "treated very promptly with caustic or excision, or the patient may suffer all the usual and distressing symptoms of secondary syphilis." This is both ancient and modern, although by no means in conformity with the views of our best syphilographers. In speaking of the removal of foreign bodies from the cornea, his forgetfulness to mention the advantages derived from the anæsthetic properties of the hydrochlorate of cocaine is striking, although, further on, he advises a 5 % solution of this drug as a sedative in ulceration of the cornea.

In the treatment of the different varieties of talipes, he speaks decidedly against excision of portions of the tarsus, and recommends the simpler and, in young children, far safer plan of manipulating the foot into position with or without the aid of tenotomy, according to the requirements of the case. For a dressing he uses plaster of Paris.

Take it altogether the book will be of use to the profession. The views advanced are conservative and, in the main, sound. Its writer has evidently endeavored to embody the results of his own experience, which seems to have been somewhat extensive, rather than attempt to bolster up the pet theories of others, and for this reason alone it is worth reading.

GEORGE R. FOWLER.

THE PRINCIPLES AND PRACTICE OF GYNÆCOLOGY. By THOMAS AD-  
DIS EMMET, M.D., LL.D., Surgeon to the Woman's Hospital, New  
York. Third edition, thoroughly revised. Philadelphia: Lea Bro's  
& Co. 1885.

The appearance of the third edition of this work, largely rewritten and thoroughly revised, is probably the form in which its author's ideas will finally stand.

For over thirty years Dr. Emmet has been a leader in the gynæcological world, and it is not likely that any further radical changes will be introduced by him. Indeed, any further alterations, to judge by the main changes in the third from the second edition of his book, will be in the direction of the more pronounced enunciations of his characteristic opinions. We deem, therefore, the present a suitable time to try and estimate the ultimate value of Dr. Emmet's teaching, and, taking this third edition as the maturer expression of his life-long work, to gauge, as far as lies in our power, just what he has contributed to the stores of medical truth. We are, to some extent, invited and even compelled to do this by the claims the author himself advances for his own work. In his preface, he more than hints that his own views are already forming a new school of gynæcological pathology and therapeutics, and in some of the reviews of this book, we have seen, the claim is still more urgently pressed. In the preface to the third edition Dr. Emmet says:

"A portion of the manuscript of the first edition of this work was expunged or rewritten, by the advice of a friend, with the object of omitting or modifying certain views therein expressed, which were then deemed too decided. It was thought that the profession was not in a condition to receive views so radically different in character from those universally accepted. The opinion was expressed that even the success of the book might be jeopardized by urging the necessity for a revolution so complete as to establish a new school.

"Since that time the entering wedge has been pressed forward, and good has already resulted from the teaching of a more radical course of treatment."

The clinical character of the work is what strikes us first. It is true that on the title page we are told it is a work on the principles and practice of gynæcology, but Dr. Emmet described it much more accurately in the preface to the first edition, when he said: "This work is essentially a clinical digest." That fact reveals at once the strength and the weakness of the work before us. No one can fail to recognize the conscientious industry with which Dr. Emmet during long years has tabulated thousands of cases and the valuable facts they often contain



They show the author's accurate powers of observation and the ingenuity of the devices of treatment, so often peculiar to himself, which he used. It was mainly his manipulative skill and his unrivalled ability in plastic surgery that have won for Dr. Emmet his world-wide reputation. But in this last edition much less emphasis is laid on the technical side of the gynæcologist's art, and the burden of the song is more and more concerned with the new principles of pathology and therapeutics. And here Dr. Emmet enters a broader field, one which he will not be allowed to claim undisputed. Moreover, the pure clinical basis on which his superstructure rests is no longer the stronghold sure that it was in the technical department. The especial requisites needed in this new field are a broad knowledge of general pathology and a sound and wide knowledge of general therapeutics.

And in these two departments Dr. Emmet is somewhat conspicuously deficient; with regard to the pathological side of the question it is slightly comical to read the reference to that far-off time in his youth, when he attended post-mortems, that this book contains. Nor does he seem to have sought for in others the knowledge he himself had not the opportunity to acquire. Throughout this book there is startling ignorance of the work of others, for it could hardly be that he would wilfully ignore the light.

In the department of general therapeutics, the purely special character of Dr. Emmet's practice for over twenty-five years, limited, as he tells us, to consultation and special hospital work, precludes a wide sweep of the subject, and the therapeutics of the book amply bears this out.

If now we turn to the cardinal doctrines of this new school, we find its creed briefly formulated: pathologically, the chief factor in causing the diseases of women is pelvic inflammation outside of the uterus, *i. e.*, pelvic cellulitis; therapeutically, the chief factor in the treatment of the diseases of women lies in the cure of the cellulitis by means of—hot-water.

Now, no one will deny that both these factors, though not unknown before Dr. Emmet's time, were not sufficiently done justice to in the treatment of the diseases of women, till he appeared. It is in elevating them to the rank he does that he simply discredits much of his own best work. Thus, in laceration of the cervix, we were originally taught by Dr. Emmet to make a diagnosis by bringing the everted lips together by means of two tenaculæ. Now we are taught that it all depends on cellulitis, that it may be necessary to subject the patient to preparatory treatment (*i. e.*, to remove the cellulitis), to even make a diagnosis, while, if no blood poisoning and septic cellulitis occurred at the

time of the laceration, the latter "however extensive, will rapidly heal without an untoward symptom."

Surely paradox could not go further. We have always held that Dr. Emmet's chief contribution to our knowledge was in the operation which bears his name, and that on that his fame would ultimately rest. It is, therefore, with regret that we see him in this work, to a certain extent, depreciating the value of that operation. He tells us that he operates now far less frequently for lacerated cervix than he used to do, and if this were but a caution to restrain the zeal of his over-zealous followers, it would be not only good, but worthy of our highest admiration. But it is in the reasons that he alleges, why he is now less bold, and in the extraordinary importance he assigns to complicating cellulitis at the expense of the original trouble, that he robs the caution of its chief value. Here, as elsewhere, the positiveness of Dr. Emmet's statements are apt to deprive them of much of their value, because it conflicts with the positiveness of the Dr. Emmet of twenty years ago.

In no department of the subject are the teachings of Dr. Emmet more likely to do harm than in his treatment of the subject of endometritis. True to his instinct to find in cellulitis the clew to all uterine disease, Dr. Emmet entirely denies that chronic inflammation of the uterus can exist, and reduces all cases, usually classified under catarrhal inflammations, to the results of obstructed venous returns.

It is true that he speaks of a "congestive hypertrophy," which raises the suspicion that it is our old friend endometritis under a new name. But the author is true to his topic, for, denying in toto the value of intrauterine medication, he proceeds to combat his congestive hypertrophy by the same means that he does his cellulitis, of which indeed it is but the product.

He completely ignores the anatomical facts that militate against this purely mechanical view, forgetting that the peritoneal cavity of the body of the uterus, unlike that of the cervix, has no underlying connective tissue (Henle), and that the entire blood supply of the organ is by vessels entering and leaving almost perpendicularly to the axis of the body; these vessels (arterial and venous) freely anastomosing with one another are in relation, above, with ovarian arteries and veins, below with the uterine ones proper. The fact that these veins are without valves is the best evidence of the provision made by nature that obstruction from cellular deposits here and there, unless quite extensive, shall not materially obstruct venous return. The *reductio ad absurdum* of his own theory is furnished by the author when he naively remarks (page 32): "The simplest form of congestive hypertrophy may be illustrated by the condition found in a woman who has never been

impregnated, where it exists as if it were a protest on the part of nature, the true function of the uterus never having been called into play. Few unmarried women reach the age of 35 years without suffering more or less from this condition whenever the function of nutrition becomes impaired from nervous disturbance; and this is likely to be the earliest manifestation." True! most true! but where in them is the antecedent cellulitis?

It was to the chapters on laceration of the perineum that we turned with most interest; for, after reading the author's paper at Philadelphia, before the American Gynæcological Society, we were led to expect a wide departure from his previous teachings. In this we are not disappointed, but when we come to consider the new operation that Dr Emmet now brings forward, we are at a considerable loss what to say. We must honestly confess that after reading for a second and even third time his description, we do not understand it. To some extent this is doubtless due to the lack of diagrams.

So far as we understand Dr. Emmet now, his contention is that in itself laceration of the perineum, excepting through the sphincter, is of little or no consequence; it is only when separation from the pelvic fascia or rupture of portions of the muscles occurs, that any operation is called for. And, moreover, this condition may be, and often is, independent of any superficial tear at all, namely subcutaneous or sub-mucous.

He tells us that in his new operation for diminishing the vaginal outlet, and in his old operation for restoring the perineum, essentially the same extent of vaginal surface is denuded and the same trefoil shape is formed, excepting that in the new operation less of the labial tissue is denuded. "The only difference lies in the direction and mode of introducing the sutures." In this way the sutures lie entirely inside the vagina, and various advantages are claimed for that.

With the main contention of Dr. Emmet of the necessity of reuniting the torn muscles and securing the union of the perineum to the pelvic fascia, from which it has been detached, we are entirely at one. The only marvel is that the author should have to invent a new operation and write so many involved pages to inculcate so obvious a truth. It has long been a familiar caution that you must not get a mere "skin perineum" if you hope to relieve your patient. The whole subject of the perineum and the perineal body has been complicated to a degree almost unknown in any other department of surgery. It seems to us that the principles involved are easy enough; it is the execution of the steps requiring the nicest judgment that is the difficult thing. Dr. Emmet is happy in the fact that, if he has not materially lessened but

rather added to the prevalent darkness in his descriptions, he has the greater merit of being unsurpassed in his practical results.

We must pass over many interesting chapters which challenge attention. Throughout, the evidences of the author's industry, especially in the tabulation of his cases, are very striking, though, occasionally, as in some of the tables on fibroids, the practical results of it are not so evident. In the domain of abdominal surgery the author is evidently not greatly at home, and most of his chapters are derived from the authority of others. In this connection there are some inaccuracies which bear out a remark made before, that Dr. Emmet is not very conversant with the work of others. Thus, in speaking of the carbolic acid spray, he says (p. 715): "In this country I do not know of any prominent operator who now employs the carbolic acid spray." Whereas, as Dr. Sutton has pointed out, Drs. Homans, of Boston, and Battey, of Rome, who have obtained the best published results in the United States, both use the spray. Again, on p. 724, he says: "Mr. Baker Brown was obliged to resort frequently to the use of the ligature, although to the cautery was given the credit of controlling the bleeding. What Dr. Keith's practice is in regard to the additional use of ligature, I do not know. From a somewhat limited experience of the cautery I must confess to a feeling of mistrust as to its safety." Dr. Keith, using the cautery alone, has never had a case of secondary hæmorrhage.

There is one further subject of importance, on which Dr. Emmet does not speak with hesitancy, and that is the treatment of diseases of the bladder and urethra in women. For the latter class of cases he has devised a new operation, "the button-hole" operation, which is essentially a urethro-vaginal fistula, very largely similar to the method suggested by Dr. Sims, of making a vesico-vaginal fistula for the cure of cystitis. On no subject in this most positive of books does the author speak with more confidence than here. He says: "I do not hesitate now to announce the fact that the method I shall describe for exploring the female urethra is the only one within our knowledge to-day which fulfils every indication, is safe, simple, and within the scope of any one possessing the least degree of surgical dexterity."

Dr. Emmet then proceeds to classify the diseases of the urethra, all of which are best and most easily cured by means of this operation. They are:

1. Inflammation (urethritis). 2. Neoplasms. 3. Prolapse. 4. Urethrocele. 5. Fissures. 6. Laceration of urethra from dilatation.

It must be at once admitted that this new operation is simple, if not in execution exactly, at least therapeutically considered; for, however

diverse the pathological causes may be, it is delightful to know of a sure cure—all. As to the ease of execution, bringing it “within the scope of any one possessing the least degree of surgical dexterity,” we have but to recall the history of vesico-vaginal fistula, and how Sims had to travel all over Europe, personally teaching its best surgeons how to do that operation, and how to-day it is an operation the fewest are competent to undertake, to judge of this claim of its modern imitation.

We would be the last one to undervalue any new contribution to this difficult field of surgery, and we have seen at least one case of urethrocele benefitted by this means after resisting all others; and we can also conceive of other classes of cases, like urethral neoplasms, situated far up in the urethra, in which it may prove of service; but we protest most emphatically against any method which starts out with such sweeping claims as I have quoted. Such a protest is all the more needed in the present instance in consideration of the manner in which Dr. Emmet sweeps by the board all other workers in this field, living or dead, as if we had waited from the days of Hippocrates to the year of Grace, 1878, when Dr. Emmet invented this new operation for the first glimmer of light on the subject of urethral diseases.

In concluding this brief notice, we will return to the question with which we started, and that is, has Dr. Emmet established or formed a new school in gynæcology? We think this question must be unhesitatingly answered in the negative. He has been in many ways the most distinguished follower of J. Marion Sims, and has carried out, often in a brilliant and ingenious manner, the tendencies of his master.

In certain departments of plastic surgery, notably in the operation for the restoration of lacerated cervix, he has contributed things of great and permanent value. But in other fields he has remained just where Sims left off, and particularly in the continued use of silver wire sutures, while the rest of the world has been advancing; and in the larger questions of pathology, he has distinctly retrograded from the point where Sims left gynæcological science. And, finally, to appeal to the world as a founder on the basis of those retrograde tendencies will not conduce to his own fame. To establish a school of medicine on any single issue is not likely to succeed, to judge from past experience; indeed, to find a counterpart to the leading precepts of Dr. Emmet's school, we must go back to the illustrious Doctor told of in *Gil Blas*; he, too, had two main articles in his creed; one was like Dr. Emmet's, for he, too, had unbounded faith in hot water, but, unlike Dr. Emmet, he had probably never heard of cellulitis, and so found his second canon of medical orthodoxy in—phlebotomy.

W. M. THALLON.

A SYSTEM OF HUMAN ANATOMY, Including its Medical and Surgical Relations. By HARRISON ALLEN, M.D., Professor of Physiology in the University of Pennsylvania, etc. Illustrated. SECTION VI.—ORGANS OF SENSE, DIGESTION AND GENITO-URINARY ORGANS. Philadelphia: Henry C. Lea's Son & Co. 1883.

At this late date it would be superfluous for us to attempt an analysis of this fasciculus, since other reviewers have already so frequently done so. Having expressed our opinion of the demerits of the earlier numbers of this work elsewhere, viz., in the *Annals of Anatomy and Surgery*, we shall have great pleasure in pointing out here some of the points in which this work excels any other with which we are acquainted. The present fasciculus is, as was to be expected, an improvement on its predecessors, since the author's clinical work has lain for many years among the class of diseases affecting the organs of sense, so that he brings to bear upon these subjects not only a scientific but a practical experience. We regret to note the large number of errors, the result of careless proof-reading, but are glad to see that the author has inserted a printed slip containing many errata, which, as far as they go, tend to provide us with a correct text. It is a matter of surprise that Dr. Allen has not before resorted to this manifestly easy method of correcting errors which have been detected too late for amendment of the text. As an instance of the careless proof-reading, we would merely cite the "explanation" of plate XCV, figs. 1 and 2, which are stated to be "a structure of the cornea as seen when magnified." Now, if they are microscopic sections of any of the ocular structures or appendages they are cuts of the eyelids, for sweat-glands, hairs and hair follicles, sebaceous glands, fibrous tissue and the papillæ and epithelium of a cutaneous surface are recognizable at a glance. On the previous page there is a diagrammatic cut of the cornea numbered 128, yet the text refers in five places to figure 127, which displays the capsule of Tenon; while another reference in the same explanation of the corneal structure directs the reader to figure 129 which is "a vertical frontal section of the left eye and of the nasal chamber of the same side."

But we have already, elsewhere, mentioned the chief faults of the book, so that we shall now proceed to the much more grateful task of calling attention to the superiority, in many respects, of Dr. Allen's book over other anatomical treatises. We would especially call the attention of our readers to the fact that in no other English work is there such an accumulation of interesting facts bearing upon the causation of so-called anomalies or, more properly speaking, variations. This remark applies to the earlier numbers as well as to this fasciculus. Be-

sides these there are numberless isolated facts which, while of small value by themselves, help, when properly related to others, to elucidate more important points.

We would also commend the partial adoption of the plan, best exemplified by Braune's Topographical Atlas, of showing the proper relations of certain of the viscera by sections through the intact body. Omissions, to which the attention of the author has been called by various reviewers, have been atoned for by the introduction of some of the neglected facts in the section on regional surgery. This is notably the case with regard to the bursæ.

The section on Embryology and the study of malformations supplies a long-felt want, and, together with cuts of typical examples and references to authors, gives in a condensed, yet clear form, all the information which most men either desire or need. Many of the illustrations in this fasciculus are also far more satisfactory to us as artistic productions, although there is much room for improvement. Other commendable points could be dwelt upon, but sufficient has been said to indicate their general character.

In conclusion, we desire to express our satisfaction with the work as a whole, which, while it contains many errors and inaccuracies, yet atones for these in a great measure by assembling together a mass of facts relating to practical points to obtain which the student would be compelled to read widely, and that, too, in works written in many tongues.

C. B. NANCREDE.





ON PRELIMINARY LIGATURE OF THE LINGUAL  
ARTERIES IN EXCISION OF THE  
TONGUE, WITH A REPORT  
OF THREE CASES.<sup>1</sup>

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THE operation which I intend discussing in this paper is that introduced by Prof. Billroth, of Vienna, viz, excision of the tongue by scissors, with preliminary ligature of the linguals. In excising the tongue for malignant disease, besides the necessity for avoiding danger from hæmorrhage, it is important that structures in the neighborhood, which have become involved, should be removed, and the operation which facilitates this removal, without running much additional risk, is the one to be preferred.

Billroth's operation, in my opinion, fulfills these conditions, and the mortality following it is not greater than that of other operations for removal of the tongue.

In most of the English and American text-books on Surgery it is but briefly or not at all mentioned. Ligature of the lingual artery is described, certainly, but only as an operation to be performed on the dead subject, the difficulties and dangers attending its performance on the living subject are passed over.<sup>2</sup>

I shall briefly describe Billroth's operation, mentioning the difficulties I have met in performing it.

<sup>1</sup> Read before the Surgical Section of the Canada Medical Association, September, 1885.

<sup>2</sup> Since writing the above Mr. Henry T. Butlin's admirable work on "*Diseases of the Tongue*" has appeared, in which the various operations for removal of the tongue, including ligature of the lingual, are fully described.

*Operation.*—The head of the patient having been well thrown back and the chin turned to the side opposite to that on which the artery is to be tied, a curved incision is made from near the symphysis menti to near the angle of the lower jaw, the convexity downwards, having its lowest portion running along the upper border of the great cornu of the hyoid bone; a careful dissection is then made through the platysma and deep cervical fascia, and if any veins are cut they should be ligatured before proceeding further with the operation. The tendon of the digastric muscle should now be searched for, and in the angle this tendon forms with the hyoid bone, the artery will be found—but not immediately, for covering it we have the hyoglossus muscle with the hypoglossal nerve and ranine vein running over it. The hyoglossus muscle should be carefully divided and then, all bleeding having been arrested by Péan's forceps and ligatures, the artery is felt pulsating at the bottom of the wound. Hæmorrhage should now be completely arrested and the artery being brought into view can be easily tied. I have been in the habit for some time past, when ligaturing arteries, of placing two ligatures on the vessel and cutting between them, and I do the same when ligaturing the lingual. By this method we are certain of the artery being occluded, and cannot easily mistake it for the large vein which sometimes accompanies it. The artery on the opposite side having been secured in the same way, any glands that may be involved should be looked for and removed through these incisions in the neck. As a rule, they can be found without difficulty. In all my cases I had to remove the submaxillary gland of one side, and in two, some of the cervical glands. If the submaxillary glands are not involved they should be treated tenderly and not cut into, as afterwards they may take on troublesome inflammatory action.

The mouth should now be kept open with a gag and the tongue drawn out by a double ligature passed through its substance about an inch from the tip. The operator, holding the ligature in his left hand, draws the tongue outwards and upwards and removes it with a straight pair of scissors. The attachments of the tongue to the jaw and pillars of the fauces should first be freed and then the muscles at the base, and the attach-

ment to the hyoid bone divided with a few short cuts, and the whole tongue will come away, leaving the epiglottis behind. The removal of the tongue takes, as a rule, only two or three minutes. If the tissues of the floor of the mouth be involved they should now be attended to.

The wounds in the neck, which during the excision of the tongue should be filled with carbolized sponges, are then sewed up with catgut or silk ligatures and dressed with iodoform and pads of jute or cotton wool. If the floor of the mouth has been removed it will be better to pass a large drainage tube into the mouth through the neck incision; in fact, this ought to be done in every case. The mouth is now packed with iodoform gauze and the operation is complete. The after-treatment is the same as after excision of the tongue by other methods, and I shall not now discuss it.

The difficulties of the operation are not so great as I had expected, and any one with a fair knowledge of the anatomy of the parts, and some experience in operating, can easily overcome them. The following points are worth remembering in performing the operation: (1.) The veins in the neighborhood of the hyoid bone (such as the facial, anterior division of the temporo-maxillary and the trunk formed by these two) are frequently of large size, and if wounded give rise to tremendous hæmorrhage, so if possible, when seen, they should be divided between two ligatures. If by accident they should be cut, the hæmorrhage can be quickly arrested by Péan's forceps. It is very important that all hæmorrhage should be arrested before attempting to pass a ligature round the artery, as otherwise the difficulties of the operation are much increased. The large ranine vein frequently passes beneath the hyoglossus muscle with the artery, and has been mistaken and tied for the artery by Billroth. He mentions that this occurred on two occasions in old people who had thick-walled veins.

(2.) The submaxillary gland is frequently of large size, especially when diseased, and covers the space between the jaw and the hyoid bone. This complicates the operation and the gland has to be dissected away or lifted up by hooks.

(3.) The digastric muscle is occasionally bound down by the cervical fascia to a considerable portion of the hyoid bone, and

has to be separated from it before the artery can be reached. This occurred in one of my cases.

(4.) The artery itself has sometimes an abnormal course; it may run on the surface of the hyoglossus muscle instead of beneath it; it may rise at a higher or lower level than usual from the carotid, or in common with the facial or superior thyroid, and cross beneath the hyoglossus at a point above or below the normal one. Whilst ligaturing the lingual on a dead subject this spring I failed to find the artery, and thought I had a case of absence of the lingual, which is a very rare condition indeed; but on further dissecting the parts, I found the artery given off in common with the superior thyroid, near the bifurcation of the carotid. It then passed up towards the middle line of the neck and over the hyoid bone, internal to the lesser cornu, pierced the hyoglossus muscle and then reached the tongue in the usual way. As I mentioned above, the artery may be absent altogether. These anomalies, of course, are very rare. I have only met one example of each of the last three, in ten years' experience in practical anatomy and a dissection of over 350 bodies.

In ligaturing the lingual the one guide which the operator must rely on is the great cornu of the hyoid bone; it can always be easily felt and its relation to the artery is, practically, always constant. Some authorities advise ligature of the lingual near its origin from the carotid, but here the operation is more difficult, owing to the large veins which often cover it, and to the absence of any certain guide; besides, the artery is not so constant in its point of origin from the carotid as it is in its relation to the hyoid bone and hyoglossus muscle.

Whatever operation for excision of the tongue is practised, the mortality in a series of cases is about the same, so that the method of operating seems to have less effect on the results than the after-treatment. Still certain operations are more favorable than others, as regards the recurrence of the disease, and it is reasonable to suppose that where the disease is more completely removed it is less likely to return.

The advantages of the operation I have described are many:

(1.) The diseased structures, and especially the glands, are discovered and removed with the greatest ease through the neck incisions.

(2.) The removal of the tongue is bloodless and there is no fear of secondary hæmorrhage.

(3.) The incision made by the scissors is a clean cut one, and there is no bruising of the tissues as in the operation with the *ecraseur*.

(4.) The tongue can be more completely and more easily removed with scissors than with any *ecraseur*.

(5.) Drainage of the mouth can be more thoroughly carried out by means of the incisions in the neck.

(6.) The operation is easy of performance and few instruments are required, no more than every surgeon possesses, viz.: Straight scissors, knife, and a few pairs of Péan's forceps.

It is my belief that the operation of the future for excision of the tongue will be the one that most easily enables the surgeon to remove diseased glands in neck, and that hereafter no operation for removal of the tongue will be considered complete without incisions in the neck through which these diseased glands can be easily felt and removed. Every surgeon now admits that in excision of the breast for malignant disease, it is necessary to look for and remove all diseased glands in the axilla. If this rule is carried out in excision of the breast, why not in excision of the tongue?

One of the three cases in which I made use of Billroth's method of excising the tongue died, but this was not owing to the method of operating, but to an avoidable cause, erysipelas. In the two other cases the disease was far advanced and the structures about the floor of the mouth much involved. In one, the patient lived seven months after the operation, and in the other, fourteen and one-half months: and for six of these he was free from the disease.

Of course no correct deduction can be drawn from so few a number of cases, but on *a priori* grounds the operation seems to me to be one that calls for the support of surgeons.

Billroth's seventeen last reported cases all recovered. This is to be attributed to the after-treatment by antiseptic (iodoform) gauze, a method I followed in my last case, and intend to follow out in all my future ones.

Billroth's operation is to be preferred to that of Kocher on account of its greater simplicity. Kocher performs preliminary

tracheotomy as well as ligature of the linguals. Thirteen out of fourteen of his cases recovered. Still the operation as performed by Kocher is a very formidable one, and I cannot help thinking that the preliminary tracheotomy increases the risk run by the patient.

CASE I. Wm. M., æt. 42, came to hospital in November, 1883, suffering from recurring malignant disease of the tongue. In May last had had a portion of the tongue removed for epithelioma. Almost three months ago noticed that stump of tongue was getting sore; this soreness gradually increased, and when he entered hospital the whole stump of tongue was involved, as well as right tonsil and anterior pillar of fauces. The glands in submaxillary region enlarged. Operation November 10; the linguals were first ligatured by a curved incision in each side, from near symphysis to a little below angle of jaw and the affected glands removed, including the submaxillary gland of right side. The tongue was then quickly excised by scissors, and the floor of mouth, right tonsil and right pillar of the fauces cleared of diseased structures. The only hæmorrhage that occurred was whilst removing the right tonsil, which was done through the wound in the neck. The neck wounds were then closed and a large drainage tube put through the inner angle of wound on right side of neck into the mouth, and the whole dressed with iodoform gauze and borated cotton pads.

The man was fed for the first four days entirely by the rectum, the mouth being washed out with a weak solution of Condy's fluid, and pieces of ice given occasionally to quench thirst. For five days the man did well, and the wounds made for ligature of linguals healed by first intention. On November 15, erysipelas appeared on the nose and spread rapidly over the face, head, neck and chest; temperature 103-104°; pulse 120. The wound in mouth now became sloughy. This condition persisted without special change until the 27th, when the breath became fetid and a cough developed with indications of septic trouble in the lungs. During all this time there had been no rigors or sweatings. He gradually became weaker, and on December 2 died suddenly of profuse hæmorrhage from the lungs. At the autopsy the mouth wound looked in process of healing, and the disease had apparently been all removed; the wounds made in neck for ligature of linguals were completely healed and the arteries themselves presented thrombi at the site of ligature. There was a small pocket of pus beneath the left sterno-mastoid muscle; the trachea and bronchi were filled with blood. The right lung presented four areas of circumscribed

gangrene; the left lung two, each about the size of small apples. Placing the lung under water, and blowing air through the pulmonary artery, bubbles escaped from one of the gangrenous regions close to the root of the lung. Dissection showed that the hæmorrhage came from a small branch of one of the main divisions of the bronchial artery which had been opened in the necrotic process.

The bad result of the operation was in no way due to the manner in which it had been performed. The wound in the neck healed without difficulty and added nothing to the risk. The erysipelas was no doubt developed from a case which had been inadvertently admitted into the same ward a few days before.

CASE II. THOS. K., æt. 54, a tall, spare man, of intemperate habits and an inveterate smoker, was brought to me by Dr. Geo. Ross, February 24, 1884, suffering from cancerous disease of under surface of the tongue and the gum lining the inner side of the middle of jaw. Four months ago first noticed a lump under right side of tongue which increased rapidly in size and soon ulcerated. Had, when first seen, a hard cancerous growth involving the whole of the under surface of the tongue near the root, the floor of the mouth and the gum lining the lower jaw. The submaxillary glands and deep cervical glands much enlarged. Removal of tongue and floor of mouth decided on. The operation was performed February 25, 1884. The linguals were first ligatured by same incision as in previous case. The ligature of the right lingual was rather difficult owing to the great enlargement of the submaxillary gland. The gland was removed and facial tied as well. The ligature of left artery was comparatively easy, except that a large vein at outer edge of wound was wounded and gave rise to considerable hæmorrhage, which, however, was soon stopped by a Péan's forceps and the vein tied. The left submaxillary gland was not taken away. Through the incisions in neck some enlarged cervical glands were removed. Both arteries were tied in two places with catgut and divided between the two ligatures. They were large and tortuous. After drawing out the tongue by a ligature placed a short distance from the tip, it was removed by scissors. The whole tongue was thus removed without difficulty and without hæmorrhage. The diseased gum and the floor of the right side of the mouth was then dissected away, leaving free communication between the external wound and the mouth. The wounds in neck were then sewed up with catgut and on the right side a large drain put through the wound into the mouth; the mouth was packed with iodoform cotton wool. The patient did very well, the temperature not rising above 99°. Every day for the first week

the mouth was washed out by means of the drainage tube and the packing daily replaced. The wound in the neck healed by first intention except where drainage tube remained, and there never was the slightest trace of fetor. As in the first case, the patient was fed per rectum the first few days with beef tea and brandy, and after that he took his nourishment by the mouth. In three weeks the patient went home with the mouth wound all healed and only a small fistulous opening in neck where drainage tube had been.

The disease returned in floor of mouth two months after the operation, but his general health remained good. By July the growth had increased considerably and in September he began to have hæmorrhages, till finally he died of exhaustion September 21, 1884, about seven months after the operation.

CASE III. Wm. H., æt. 60, a robust, healthy looking man, carter, came to the Montreal General Hospital May 14, 1884, complaining that he had a sore under his tongue which was very painful and which was rapidly getting worse.

Some months ago first noticed a small lump on the under surface of the left side of the tongue; this gradually increased in size till four weeks ago, when it broke and left an ulcer. On examination a foul, slough-looking ulcer, size of a twenty-five cent piece, with ragged edges and a hard indurated base, was found on the under surface of the tongue a little to the left of the frenum. The submaxillary glands of that side and the deep cervical glands were enlarged and indurated. Diagnosis, malignant disease. The operation of removal of the tongue was performed on May 15, 1884. The linguals were tied by the same incision as other cases. The right artery was tied without much difficulty, except that the digastric tendon was bound down to the hyoid bone to a greater extent than usual and had to be separated. On the left side, owing to the great enlargement of submaxillary gland, the space between it and the hyoid bone was much constricted and the artery was secured with greatest difficulty. In the dissection the large temporo-facial vein had to be tied. The submaxillary gland of this side was then removed and the facial artery tied, and by extending the incision outwards the enlarged cervical glands which were on the sheath of the vessels were removed. The tongue was then excised with scissors in the usual way without hæmorrhage; but as the last snip was made the epiglottis fell back and almost asphyxiated the patient. I immediately introduced my finger, turned back the epiglottis and passed a catgut ligature through and made it fast outside the mouth. The wounds in the neck, which had been filled with carbolized sponges, were now well



washed out with bichloride solution and sutured. As there was an opening into the mouth on the left side owing to the extensive dissection of the floor of mouth and removal of the submaxillary gland, a large drainage tube was passed into the mouth. The wound was then dressed with iodoform gauze and borated cotton and a bandage applied. The mouth was also packed with the same gauze and then the operation was complete.

The patient recovered well from the operation. He was fed per rectum for a week and the dressings in mouth and left side of neck removed daily, and the parts thoroughly washed through the large drainage tube. By the end of the first week the wounds in the neck, except where drainage tube passed into the mouth, were healed by first intention and the mouth wound was looking healthy and healing rapidly. It was found that the patient was totally unable to swallow liquids, so he was fed by a tube passed into pharynx. By June 1 the wound in the mouth had healed entirely and the only part that remained unhealed was the fistulous opening where the drainage tube had been. The patient was very self-willed and of an irascible disposition and frequently used to get up at night in spite of the nurses and walk about. He in this way contracted a bronchitis which kept him in hospital longer than he otherwise would have been; his breath and expectoration were fetid, the latter was very profuse. He still was unable to swallow fluids, but could take solids fairly well, so he was still fed with the pharyngeal tube. He left the hospital June 17, a little more than a month after the operation. In January, 1885, eight months after the operation, he came to see me and at that time he had some enlargement of the glands of the neck, but mouth was perfectly clean. He still had to take his liquids by means of a tube, which he passed himself; his family told me that nothing would induce him to attempt to swallow liquids without the tube. In June, 1885, the glands on both sides of neck were enlarged and he had some induration in floor of mouth; this gradually increased and he failed rapidly, dying of exhaustion July 29, 1885.

Although the results in these three operations are not very brilliant, still I feel that had I similar cases to deal with again I would operate in the same way. In all three cases the disease was very extensive and not confined to the tongue alone, the involvement of the glands being a marked feature. In such cases any attempt to remove the diseased structures, without the neck incisions, would have been as useless and as unscien-

tific as operating on cancer of the breast and allowing the enlarged glands in axilla to remain without extending the incision to remove them. In the two cases which lived the relief was evident, though in Case II not so permanent as one could have wished. In Case I the neck wounds were in no way responsible for the fatal result and in the other two cases did not retard recovery, but, on the contrary, rather hastened it by the greater facility afforded for drainage and thorough washing of the mouth.

In each of the three cases removal of the tongue was remarkably bloodless and even the ligation of the linguals was not attended with any hæmorrhage worth mentioning. The facility with which the affected glands were removed through the neck wounds was very great.

INJURIES OF THE MAIN BLOOD-VESSELS IN  
THE AXILLA CAUSED BY EFFORTS  
TO REDUCE DISLOCATIONS  
OF THE SHOULDER.<sup>1</sup>

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DISLOCATION of the shoulder, an injury, both relatively to the other dislocations and actually, common, is, at least when recent, deemed one of minor gravity, the cure of which can be effected readily and without risk to the patient. But, from time to time cases are reported in which the gravest consequences have followed reduction or the attempt to reduce, and such accidents have happened and continue to happen in the practice of even the most experienced surgeons, aided by anæsthetics and employing methods of manipulation rather than those of force. The importance of the general recognition of this possibility, the interest attaching to certain questions of diagnosis and treatment, and the discovery of certain errors current in the statistics of the subject, have led me to bring before you a question which, within the last few years, has been the theme of several writers, and with which all are reasonably familiar.

Among these accidents, the most frequent and most important are those of injury to the main blood-vessels in the axilla.

Although the earliest recorded cases of this accident occurred at about the beginning of the eighteenth century, the subject did not receive the attention of systematic writers on surgery until after the publication, in 1827, of an article by

<sup>1</sup> Read before the New York Surgical Society, May 26, 1882.

Flaubert.<sup>1</sup> Malgaigne, in 1855, discussed the subject at length in his work on dislocations, mentioning sixteen cases of all kinds, certain and uncertain. Callender,<sup>2</sup> taking as a text his own fatal case, again collected and collated the known cases; and similar use was made of the material, and other cases added to the list by Le Fort.<sup>3</sup> Willard,<sup>4</sup> and Marchand.<sup>5</sup> In 1882 Körte<sup>6</sup> reported three personal cases, and wrote a very full and valuable paper on the subject containing forty-four supposed (actually thirty-eight; see note below) cases of dislocation of the shoulder, in which the vessels had been seriously injured during the act of dislocation or of reduction; and in 1884 Cras<sup>7</sup> reported a personal case of injury of the axillary artery, and added a few others to Körte's list. Strictly speaking, several of these cases should not be here considered, since in them the vessel was injured at the moment of dislocation and not during reduction, and in many others it remains uncertain whether the same objection might not be made to them. They are retained because they serve equally well with the others to further the study of most features of the subject.\*

<sup>1</sup> "Mém. sur plusieurs cas de luxations dans lesquels les efforts pour la réduction ont été suivis d'accidents graves," "Répertoire d'anat. et de phys.," 1827.

<sup>2</sup> "St. Bartholomew's Hosp. Reports," vol. ii, 1866, p. 96.

<sup>3</sup> "Dict. encyclopédique des sci. méd." Article *Axillaire*.

<sup>4</sup> "Phila. Med. Times," 1873, vol. iii, p. 721.

<sup>5</sup> "Des accidents qui peuvent compliquer la réduction des luxations traumatiques," "Thèse de concours," Paris, 1875.

<sup>6</sup> "Arch. für klinische Chirurgie," vol. xxvii, p. 631.

<sup>7</sup> "Bul. de la société de chirurgie," 1884, p. 739.

\* Reference to the original accounts, so far as I have been able to obtain them, shows several errors in the lists given by the above-mentioned writers. Sir Astley Cooper's case must be excluded because it is the same as Gibson's first case, having been simply quoted by Cooper without acknowledgment.

Blackman's case must be excluded because it proved to be not a dislocation, but a fracture of the humerus. As it has been widely quoted, and is, indeed, given in detail as a dislocation by Dr. Hamilton ("Fract. and Disloc."), an explanation of the manner in which the error arose may be of service. Blackman reported it as a dislocation in the "*Western Lancet*," August, 1856, p. 469, and an abstract of this report was given in the "*American Journal of the Medical Sciences*," 1856, vol. xxii, p. 571, and is quoted by most writers. But on page 508 of the same (August) number of the "*Western Lancet*" is a note by Blackman, which apparently had been overlooked by the maker of the abstract, giving the results of the autopsy and showing the error in the diagnosis. The fracture was at the surgical neck, and the end of the shaft had been displaced upward and lay in contact with the coracoid pro-

The trustworthy recorded cases of injury to the larger vessels of the axilla in dislocation or reduction of dislocation of the shoulder are forty-four in number. Of these, the axillary vein alone was ruptured in three (Froriep,<sup>1</sup> Price,<sup>2</sup> Hailey<sup>3</sup>), although I think the last one doubtful, and the artery and vein together in two (Platner,<sup>4</sup> Baum<sup>5</sup>). In most of the others the axillary artery or one of its branches was injured, but in some the source of the hæmorrhage remains uncertain. In thirty-two cases death or amputation of the arm furnished the opportunity to examine the region and determine the character of the lesion: this, in some cases, was a complete or partial rupture of all the coats of the artery, or of the inner and middle coats alone, with subsequent formation of a circumscribed aneurysm.<sup>6</sup> In other cases the vitality of the wall appears to have been diminished or destroyed by direct pressure, and this to have been followed, after the lapse of a few days, by rupture (Warren<sup>7</sup>), or still later, by the formation of an aneurysm. In Gibson's second case<sup>8</sup> an aneurysm appears to have

<sup>1</sup> Malgaigne, "*Luxations*," p. 151. <sup>2</sup> Callender, *loc. cit.*, p. 107. <sup>3</sup> "*British Medical Journal*," 1863, ii, p. 634.

<sup>4</sup> Malgaigne, *loc. cit.*, p. 151. <sup>5</sup> "*Deutsche Klinik*," 1867, p. 431.

<sup>6</sup> It is possible that this rupture may be followed by obliteration of the artery at the wounded part. Scarpa held this opinion (Hodgson, "*Dis. of Arteries*," p. 488.)

<sup>7</sup> "*Med.-Chirurg. Trans.*," vol. xxix, p. 25.

<sup>8</sup> "*Surgery*," vol. i, p. 334.

cess; the head was still in the glenoid cavity, and had partly united with the shaft about an inch below its upper end.

In Segond's case not only does the artery appear to have been wounded by a piece of the dish the patient was carrying, but it is doubtful even if the limb was dislocated.

In Delpsch's case it is recorded only that at the moment of reduction the patient grew pale, became unconscious, and died immediately, and there is nothing to show the cause of death.

In Fano's, the artery may have been simply compressed. O'Reilly's is the same as Adams'. The latter admitted the case into hospital, the former operated upon it.

A case which Callender quotes, a man treated by a "bone-setter," does not deserve to be grouped with those treated by professional surgeons, although the force employed—traction by twelve or eighteen assistants—was not much in excess of that recorded in some of the other cases, or of what I have myself seen employed. Not only the artery, but also the muscles were torn and the humerus was broken.

Green's case ("*Lancet*," vol. viii, pp. 189 and 283) is quoted as one of recovery after ligation of the subclavian, but the reports end on the eighteenth day with the ligation still in place, and after a free hæmorrhage on the thirteenth day.

formed in consequence of the earlier attempts to reduce, and then itself to have been ruptured when Gibson effected reduction. Rupture appears always to have taken place quite high up, and usually at the point pressed upon by the head of the humerus. Callender found it necessary to divide the pectoralis minor to reach it. In the fatal cases of injury of the vein alone the vessel was torn completely, or almost completely, across. In Baum's case both artery and vein were partly torn by a broken piece of the new bony socket that had formed about the head of the humerus. The artery was tied above the origin of the long thoracic, and a second ligature was subsequently placed on it at the level of the lower border of the pectoralis major.

In five cases (Callender, Desprès,<sup>1</sup> and Körte's three) only a small (one-sixth of an inch) oval opening was found on the anterior wall of the artery, and was thought to have been produced by the tearing off of a branch, the subscapular or circumflex.

In Gärtner's<sup>2</sup> case the opening in the artery is described as funnel-shaped, but the tumor was small, formed slowly, and presented the common signs of aneurysm, so that it seems probable that what he describes as the opening included also the neck of an aneurysmal sac. In other cases the subscapular (Lefevre<sup>3</sup>) or the circumflex artery (von Pitha<sup>4</sup>) was torn across at or near its origin. These last-named eight cases form a considerable proportion of the whole number, and are of great importance because they explain the persistence of the radial pulse noted in several of the histories.

Of twenty-nine cases in which the age of the patients is given, in twenty they were more than forty years old. The youngest was twenty (Gärtner), the oldest eighty-six (Sands<sup>5</sup>). In very few of the cases is it noted that the arteries were atheromatous, although the advanced age of many of the patients makes it probable that the elasticity of the vessels was diminished.

<sup>1</sup> "Bull. de la soc. de chirurgie," 1878, p. 116.

<sup>2</sup> "Schmidt's Jahrbüch.," 1871, vol. cli, p. 304.

<sup>3</sup> Cras, *loc. cit.*, p. 750.

<sup>4</sup> Körte, *loc. cit.*, p. 649.

<sup>5</sup> N. Y. Medical Record, 1880, p. 45.

In more than half the cases the dislocation was recent—less than three weeks. In not more than one-third of them is it reasonably certain that the lesion was caused during reduction; in three cases it was certainly caused by the dislocation; in the remainder the cause is obscure. To these latter belong those cases in which the reduction was promptly effected, and without the use of much force or of exaggerated positions of the arm.

In many of the others the attempt to make reduction was greatly prolonged or several times repeated, and the force used was very great or improperly applied. This last criticism is probably applicable to the earliest four cases (Verduc Petit, Platner, Bell), about which nothing is known except that death was caused by hæmorrhage. In one of them (Bell<sup>1</sup>) the use of the ambi is mentioned, and it is probable that it or the method of the door or ladder was employed in all.

In some the injury was evidently caused by excessive traction (Gibson, traction by five or six assistants in one case, by pulleys for nearly two hours in the other; Leudet, eight assistants); in others by faulty manœuvres, such as extreme abduction or elevation of the arm, rotation and circumduction; in others again apparently by direct compression of the vessel against the underlying bone, as by the booted heel in the axilla (Warren, Rivington<sup>2</sup>), or possibly by the thumbs (Panas<sup>3</sup>).

Leaving aside the earlier cases in which faulty methods no longer in use were employed, and those old dislocations in which the relations and connections had been permanently changed by fibrous or bony tissue of new formation, it becomes evident that in dislocation of the shoulder the accident is most to be apprehended when the elbow is raised in abduction to the height of the shoulder, or is carried, as in Callender's case, across the chest and face in a wide movement of circumduction; and for this reason, that in these movements the dislocated head of the bone is turned downward into the axilla, and the vessels which lie upon its inner side are pressed down before it and forcibly put upon the stretch, while those branches

<sup>1</sup> Callender, *loc. cit.*, p. 101.

<sup>2</sup> "*British Medical Journal*," 1872, i, p. 420.

<sup>3</sup> Marchand, *loc. cit.*, p. 52.

which run almost directly outward, the subscapular and circumflex, and are fixed to the tissues amid which they branch, are directly and forcibly elongated. Even when the head of the humerus is in its socket the axillary vessels are put upon the stretch when the arm is widely abducted, and can be readily verified during an operation for the removal of the axillary glands, or, still more simply, by observing the arrest of the radial pulse when the arm is raised and carried backward; and there are several cases on record in which this movement alone has resulted in the formation of an axillary aneurysm or in rupture of the axillary artery.<sup>1</sup> Although in dislocation inward the limb is shortened by being abducted, yet the artery is not thereby relaxed, but, on the contrary, it is still further stretched around the head of the bone. Jössel,<sup>2</sup> in a recent case in which death was caused by associated injuries, found the "nerves of the brachial plexus, especially the circumflex nerve and the subscapular artery, greatly stretched by the head of the humerus," and, according to Körte (*loc. cit.*, p. 640), he found in another case of recent dislocation the subscapular artery torn.

In his remarks on the case at the Sheffield Infirmary<sup>3</sup> in which the artery was torn across during an unsuccessful attempt to reduce a dislocation of six weeks' standing, and an incision was made through which each end of the torn artery was tied, Mr. Jackson says: "One thing was noticed on cutting into the axilla: the extreme tension caused by the pressure of the head of the humerus on the vessels and nerves when the arm was raised above the shoulder." This patient died two days after the operation.

In some of the cases in which it is certain or probable that the injury to the vessel was inflicted at the moment of dislocation, it is noted that the latter was produced while the arm was widely abducted—that is, under circumstances in which the head of the humerus would be driven downward and inward.

<sup>1</sup> Cases of Pelletan and Paget, and specimen in museum of St. George's Hospital, Callender, *loc. cit.*, pp. 103 and 107.

<sup>2</sup> "*Deutsche Zeitschrift*," vol. xiii, 1880, p. 177.

<sup>3</sup> "*British Medical Journal*," Feb. 3, 1883, p. 207.



If the dislocation is an old one, and especially if there has been much inflammatory reaction and the vessels have become firmly adherent to the bone or imbedded in unyielding cicatricial tissue, the liability to rupture is increased because of the loss of elasticity occasioned by the latter condition, and because of the limitation of the strain to a shorter segment of the vessel in the former. If, in addition, the distensibility of the vessel has been further reduced by atheroma, the danger is still greater; and this last predisposing cause may properly be deemed sufficient to lead to the rupture even when the traction is slight and the manœuvres are confined within a narrow range.

In Anger's<sup>1</sup> case, fracture of the head (?) of the humerus co-existed; in Marsh's<sup>2</sup> two pieces had been chipped off the head of the humerus, and were lying in the glenoid cavity. In several others fracture of the greater tuberosity of the humerus or of the rim of the glenoid cavity is noted; the former of these two complications is common in inward dislocation of the humerus, and could have had no direct influence in causing the injury of the vessels; the latter, also, was probably without influence, since the vessels are pushed away from the scapula, and the fragment remains attached to it.

The *symptoms* at the beginning present two widely different forms; in one, the less common, a tumor presenting many of the signs of an encysted aneurysm appears in the axilla a few days or weeks after the reduction, and increases in size rather rapidly; if not successfully treated, it soon involves the skin and ruptures externally. In the other form, the more common, a diffused fluctuating swelling, without bruit or pulsation, appears immediately, or within a few hours, in the axilla, raising the pectoral and deltoid muscles, or is, perhaps, most prominent posteriorly, and in most cases promptly reaches a large size, even that of the adult head (Lister<sup>3</sup>); the radial pulse sometimes persists. The only exception to rapid growth among the recorded fatal cases is Körte's third case (*loc. cit.*,

<sup>1</sup>"*Bull. de la soc. de chirurgie*," 1878, p. 122.

<sup>2</sup>"*British Medical Journal*," 1872, i, p. 526. Reported by Carruthers, the house surgeon.

<sup>3</sup>"*Edinb. Medical Journal*," 1873, p. 829.

p. 636), in which the extravasated blood disappeared slowly, leaving a firm, non-pulsating lump, as large as a walnut, in the course of the axillary artery, which a surgeon supposed to be a lymphatic gland, and undertook to extirpate nearly five months after the accident. It proved to be an aneurysm containing much stratified clot; the axillary artery was tied above and below, and the patient died.

In several cases the patients died promptly after the accident, sometimes after profound syncope, sometimes (Gibson's first case<sup>1</sup>) after a short period of apparent well-being, with symptoms of shock or acute anæmia. In two, which finally ended in recovery (Sands, Agnew<sup>2</sup>), the patients were at first greatly prostrated, and death by syncope threatened. In another (Marsh's) emphysema developed in the arm, and the patient died forty hours after the reduction. In this case the inner and middle coats of the artery were torn across "just beyond the point of origin of the dorsal scapular branch." The radial pulse was at first perceptible, but had ceased the next morning.

In most of the others the swelling increased, and, in a longer or shorter time, ruptured spontaneously, or was threatening to rupture when operative interference (puncture, incision or ligation of the subclavian) was resorted to. The longest period was in Bellamy's<sup>3</sup> case, six months after reduction, and even in this case the first hæmorrhage occurred five weeks after reduction.

In the cases that recovered without operation (Agnew, Sands, Malgaigne,<sup>4</sup> Desault,<sup>5</sup> Anger, Nélaton's second case<sup>6</sup>) the swelling subsided, and the ecchymosis was slowly absorbed. Agnew's patient was discharged in ten days, Anger's and Desault's in a fortnight, Malgaigne's was well on the twenty-second day, and Sands', a woman 86 years old, made a slow recovery. In

<sup>1</sup> "Surgery," vol. i, p. 325.

<sup>2</sup> Willard in "*Phila. Med. Times*," vol. iii, 1873, p. 721.

<sup>3</sup> "*Lancet*," ii, 1880, p. 260.

<sup>4</sup> *Loc. Cit.*, p. 150. <sup>5</sup> "*Fœuvres chirurgicales*," i, p. 380. <sup>6</sup> Referred to by Anger and Le Fort, *loc. cit.*

three of them (Nélaton's, Anger's, and Sands's<sup>1</sup>) the diagnosis of rupture of the axillary artery was made. Desault's diagnosis was "emphysema of the cellular tissue"; he had reduced by violent and prolonged traction a dislocation of six weeks' standing in a man sixty years old. At the moment of reduction a tumor formed suddenly under the pectoral muscle, and soon filled the axilla; the patient fainted, and the pulse was barely perceptible on the affected side; the tumor was well defined, elastic, not fluctuating, the overlying skin was not at first discolored, and percussion gave a sort of sound (*espèce de bruit*). On these symptoms rupture of the artery was excluded, and the diagnosis of emphysema made. Malgaigne and Agnew made the diagnosis of rupture of the axillary vein.

I think there is reason to doubt the correctness of the diagnosis in the last three cases, certainly in Desault's and Malgaigne's, for it was avowedly based on the persistence of the radial pulse, and, although it is not so stated in the report of Dr. Agnew's case, it seems fair to assume that the same persistence of the pulse which is noted in the report was also the basis of his diagnosis. As has been already mentioned, rupture of the subscapular or circumflex artery has several times presented similar symptoms, and, as in Mash's case just quoted, the radial pulse may even persist after rupture of the inner and middle coats of the axillary artery itself. Pelletan<sup>2</sup> had a case similar to Desault's, made the same diagnosis, and incised the tumor; the patient died of hæmorrhage, and the artery was found to have been ruptured.

In the two cases in which rupture of the vein alone was demonstrated post mortem (Froriep, Price), the patients died promptly, in an hour and a half and on the following day, respectively. In the third case Hailey's, in which this lesion is said to have been proved by the autopsy, the account of the examination is very unsatisfactory, and leaves it, I think, quite uncertain what the actual injury was. The patient was a man fif-

<sup>1</sup> Dr. Sands's patient died in May, 1885. The injury proved to have been of the axillary artery, which was occluded at a point a quarter of an inch above the origin of the posterior circumflex. The specimen was presented at the meeting of the New York Surgical Society, at which this paper was read, and a description of it will be found in the report of the proceedings.

<sup>2</sup> "*Clinique chirurgicale*, vol. ii, p. 95. Quoted by Malgaigne.

ty-nine years old; the dislocation was caused by a fall from a wagon and was very easily reduced. The symptoms were, first, pain in the wrist, then, after a few days, swelling of the shoulder and œdema of the arm; at the end of two months a tumor appeared between the acromion and coracoid (*sic*), and death by exhaustion a few days later. The tumor was blood-clot, more than two pounds being removed from the axilla.

In De Morgan's case<sup>1</sup> "it was impossible to detect the source of the hæmorrhage" at the autopsy, and it was attributed to the rupture of many and small veins. This explanation also, I think, may well be questioned, for in this case too the radial pulse persisted, and at that time no cases had yet been reported in which similar symptoms had been shown to be caused by rupture or avulsion of a branch of the main artery. If, as seems probable from the account and in view of the ignorance of this fact, the examination was mainly directed to the condition of the veins, it is not unlikely that rupture of an arterial branch may have been overlooked, especially since the symptoms were not unlike those of some of the other cases in which this rupture was demonstrated (Desprès, Körte's second case). The symptoms and course of this case were, in brief, as follows:

The patient was a man 64 years old, the dislocation subcoracoid, the reduction immediate, under chloroform, with the heel in the axilla. During the first week "there was nothing to be noticed but the ordinary swelling attending such a dislocation. This swelling, instead of subsiding, increased, and this somewhat rapidly toward the end of the first week. There was also some purple discoloration about the inner and posterior parts of the shoulder. Still, there were no appearances which might not attend an ordinary bruise or laceration about the part. But, in the course of the following week, enormous swelling had come on, extending from the elbow up the arm and over the chest to the level of the outer third of the clavicle, and over the scapula." The swelling was soft and fluctuating; the skin in places dark purple and thin; the radial pulse was natural. Fever, with slight shivering and one dis-

<sup>1</sup> "British Medical Journal," 1872, i, p. 5.

tinct chill. "About the third or fourth week an incision was made in the arm and the hand passed up into the cavity, which contained an enormous amount of blood, chiefly coagulated, extending under the pectoral muscles, down the side of the chest, and behind over a great part of the scapula, and communicating with the shoulder joint. The subclavian and axillary arteries could be felt." The man died with symptoms of septicæmia.

In Körte's second case (*loc. cit.*, p. 635) the patient was 52 years old, the dislocation forward and inward. Several unsuccessful attempts to reduce were made during the sixth month, and the last was followed by the gradual appearance of a non-pulsating swelling under the pectoral muscle, œdema of the arm, and sharp neuralgic pain. Radial pulse. The patient became feverish, the tumor softer, the skin thin, and at the end of six weeks it ruptured spontaneously. The hæmorrhage was arrested with a tampon, and the patient died shortly afterward. The autopsy showed a large cavity occupying all the space under the pectoralis major, and filled with large blood-clots. On the outer and front side of the artery, 4 centimetres below the clavicle, was a transverse oval opening measuring 0.4 by 0.3 centimetre (one-sixth by one-eighth inch), thought (*loc. cit.*, p. 650) to have been produced by the tearing off of an arterial branch.

In Després's case there was the same swelling, slowly increasing and becoming fluctuating, œdema of the arm, and persistence of the radial pulse. In addition, a bruit was audible after the tenth day, and the swelling subsequently pulsated at times. An operation for ligature of the subclavian was done on the forty-fifth day, and was followed by arrest of the pulsation, but, after the patient died, on the fifty-fourth day, it was found that the ligature had been placed upon a nerve immediately overlying the artery. The common trunk of the circumflex arteries was found to have been torn off at its origin.

On the other hand, in Körte's first case, in which the lesion proved, post mortem, to be a similar opening upon the side of the axillary artery, and of almost exactly the same size, pulsation in the brachial and radial arteries was barely per-

ceptible two months after the accident, when the patient first came under observation with an enormous pulsating swelling of the shoulder, filling the axilla and extending up to the clavicle.

These histories show, and many of the others might be quoted in confirmation, that, although the diagnosis, so far as the general nature of the accident, rupture of blood-vessel is concerned, does not long remain obscure; the identity of the injured vessel can not always be determined. If the tumor pulsates, the diagnosis of rupture of an artery may be made; and if, in addition, the radial pulse is present, it is extremely probable that the injured vessel is not the main artery, but that one of its branches, probably the subscapular or circumflex, has been ruptured or torn off at its origin. Beyond this it does not seem at present possible to go with much certainty, although the great preponderance of arterial lesions in the known cases—26 out of 28, or, adding Hailey's and De Morgan's, out of 30, or, again, adding Platner's and Braun's, in which both artery and vein were torn, out of 32—makes it highly probable in any given case that an artery and not the axillary vein has been torn.

Of the remaining 12 cases, 6 recovered without operation (Desault, Malgaigne, Nélaton's second case,<sup>1</sup> Anger, Agnew, Sands) and have been already discussed. Nélator, Anger and Sands made the diagnosis of rupture of an artery. In the other 6—Warren, O'Reilly,<sup>2</sup> Green, Volkmann,<sup>3</sup> Létiévant,<sup>4</sup> Cras—the subclavian was tied; in 5 of them with success; in 1, Green's, the result is not known.

In the last 6, and in 3 of the first 6, it seems reasonably certain that an artery was injured, for pulsation of the swelling is noted in every account that is given in detail, and such was the opinion of the surgeons who treated them. The record, then, may be made as follows; Of 44 cases, an artery (the axillary or a large branch) was ruptured in 35, the artery and vein in 2, the vein alone in 2, in 2 dissection failed to reveal

<sup>1</sup> After rupture of the tumor without hæmorrhage, and suppuration of the sac and shoulder joint. See Körte, *loc. cit.*, p. 655.

<sup>2</sup> *Cyclopædia of Anat. and Phys.*, vol. iv, part 1, p. 616, art. "Shoulder Joint."

<sup>3</sup> Körte, *loc. cit.*, p. 656.

<sup>4</sup> Cras, *loc. cit.*, p. 748.

the source of the hæmorrhage, and in 3, in which the patients recovered without operation, the symptoms do not justify a positive diagnosis.

The *terminations* were as follows: 12 recoveries, 31 deaths, and in 1 (Green's) the result is unknown; 20 received no operative treatment; of these, 6 recovered and 14 died;<sup>1</sup> In 14 the subclavian was tied, with 5 recoveries, 8 deaths, and 1 unknown result. In 6 an incision was made in the axilla, and the artery tied above and below the point of rupture; all died. In 4 the limb was disarticulated; 1 recovery, 3 deaths. The treatment in the cases that recovered without operation was simply compression of the swelling and immobilization of the arm, with the application of ice in Malgaigne's, and compression of the subclavian artery in Agnew's.

In drawing inferences from these results, it must be borne in mind that in many of the cases in which operations were undertaken non-operative treatment had previously been employed, and had resulted in a condition that made an operation necessary. Thus, using only those cases in which the record is sufficiently detailed, of the 14 cases of ligature of the subclavian, in 7 the operation was done after the lapse of several weeks or even months; in 1 on the third day, in one on the tenth day, and in 5 the length of the interval is not known. Of the 4 disarticulations, in 1 the operation was at a late date, in 1 five days after the accident, and in 2 unknown. Of the 6 treated by incision and double ligature of the axillary artery, the operation was done promptly in 2, and after a long interval in 4. Consequently the results of non-operative treatment may be tabulated as follows: Of 32 patients, 6 recovered, 14 died, and 12 (with 10 deaths) subsequently underwent operation, either because death by hæmorrhage threatened, or because of the existence of a growing aneurysm.<sup>2</sup> A fair inference is that conservative treatment may properly be tried at first, but should not be prolonged if the symptoms do not promptly yield; and, secondly, that, in case of resort to operation, ligature of the subclavian artery or disarticulation at the

<sup>1</sup> Possibly Körte's second case should be included among the recoveries.

<sup>2</sup> Körte's second case is an exception; an error in diagnosis led to an operation after the aneurysm had apparently undergone spontaneous cure.

shoulder is to be preferred to incision of the sac and double ligature of the artery.

Experience with arteries wounded under other conditions has shown that they will sometimes quite readily heal, or the opening made into them will close, under pressure accurately made at the point of injury, and it would, therefore, be proper to attempt to treat this injury by direct, limited pressure. Whether or not it would be possible to recognize the wounded point and make efficient pressure directly upon it can not be said, since the attempt does not appear to have been made. In default of such limited pressure, general compression of the swelling in the axilla seems to be the only other resource short of operation. The common treatment of ruptured artery, incision and double ligature of the vessel, was immediately resorted to in only two of these cases, Lister's and the one at the Sheffield Infirmary.<sup>1</sup> Both were promptly fatal.

An important question arises from these facts in connection with the treatment of dislocation of the shoulder. How far does the possibility of the occurrence of this accident affect the choice of a method of reduction? and also concerning the propriety of attempting reduction in cases that are not recent.

In the reduction of recent dislocations, these accidents show that abduction of the arm especially should be avoided, as also circumduction, violent traction, and rough pressure in the axilla. Kocher's method by manipulation appears well adapted to avoid the danger. It is also to be remembered that the injury to the vessel may be caused by the dislocation itself, and its symptoms may be masked by the swelling commonly present during the first few days.

In old dislocations the probability of the occurrence of the accident is increased by the more forcible measures usually necessary to break up the adhesions that bind the bones in their new relations; and, while it may be proper in many cases to make the attempt to restore the limb to usefulness, this possibility creates another reason for abstention when the patient is old, the duration of the dislocation long, and the adhesions firm. Even a dislocated arm may be very useful, and the fatal-

<sup>1</sup>*"British Medical Journal,"* February 3, 1883, p. 207.



ity of this accident, more than 70 % of deaths, may well cause the surgeon to hesitate to incur the risk merely for the sake of ameliorating a condition which does not endanger life and is quite compatible with activity and usefulness.

## LIST OF CASES.

A. *Fatal without Operation.*

1. Verduc (Malgaigne, "*Des luxations*," p. 149); artery wounded; no treatment; death by hæmorrhage.
2. Petit (Malgaigne, "*Des luxations*," p. 149); artery wounded; no treatment; death by hæmorrhage.
3. Pelletan (Malgaigne, "*Des luxations*," p. 149); artery wounded; puncture; death by hæmorrhage.
4. Platner (Malgaigne, "*Des luxations*," p. 149); artery and vein; death by hæmorrhage.
5. Leudet (Malgaigne, "*Des luxations*," p. 149); artery; 57 years. Dislocation 11 days.
6. Froriep (Malgaigne, "*Des luxations*," p. 149); vein; 26 years. Dislocation 3 weeks.
7. Gibson, I, "*Surgery*," i. p. 325; 50 years. Disloc. 2 months. Death in a few hours.
8. Price, quoted by Callender; vein. Death on following day.
9. Körte, I, *Arch. für klin. Chir.*, vol. xxvii, p. 631; artery; 25 years. Disloc. recent. Puncture.
10. Körte, III, *Ibid*; artery; 52 years. Disloc. 5½ months. Rupture.
11. Mash (Carruthers), "*Brit. Med. Jour.*," 1872, i, p. 526; artery; 38 years. Disloc. recent.
12. Hailey, *Ibid.*, 1864, p. 634; 59 years. Disloc. recent.
13. De Morgan, *Ibid.*, 1872, i, p. 54; 54 years. Disloc. recent. Incision.

B. *Ligature of the Subclavian.*

14. Green, "*Lancet*," 1825, vol. viii, pp. 189 and 283; 33 years. Disloc. recent. Result unknown.
15. Warren, "*Med.-Chir. Trans.*," vol. xxix, p. 25; 30 years. Disloc. recent. Recovery.
16. Gibson, II, *loc. cit.*, p. 334; 35 years. Disloc. 9 weeks. Death.
17. O'Reilly (Adams), "*Cyclop. of Anat. and Phys.*," vol. iv, p. 616; 50 years. Disloc. recent. Recovery.
18. Nélaton, I, "*Path. Chir.*," ii, p. 368. Disloc. old. Death.

19. Rigaud, "*Dict. encyclop.*," art *Epaule*; artery; 31 years. Death.
20. Von Pitha (Körte), *loc. cit.*; artery; death.
21. Volkmann, *loc. cit.* Recovery.
22. Panas (Marchand, p. 52); artery. Disloc. recent: death.
23. Després, "*Bull. de la soc. de chir.*," 1878, p. 116; artery; 40 years. Recent: death.
24. Gärtner, "*Schmidt's Jahrb.*," 1871, vol. cli, p. 304; artery; 20 years. Recent: death.
25. Létievant, "*Bull. de la soc. de chir.*," 1884, p. 748. Recent; recovery.
26. Lefeuve, *Ibid.*, p. 750; artery; 52 years. Recent; death.
27. Cras, *Ibid.*, p. 739; 45 years. Recent: recovery.

#### C. Double Ligature—all fatal.

28. Callender, "*St. Barthol. Hosp. Rep.*," vol. ii, p. 96; artery; 61 years. Disloc. old.
29. Wutzer, "*Arch. für klin. Chir.*," vol. x, p. 308.
30. Körte, II, *loc. cit.*; artery; 29 years. Disloc. recent.
31. Lister, "*Edinb. Med. Jour.*," 1873, p. 829; artery 58 years. Disloc. 8 weeks.
32. Rivington, "*Brit. Med. Jour.*," 1872, i, p. 420; artery; 71 years. Disloc. recent.
33. Sheffield Inf., *Ibid.*, 1883, i, p. 207; artery; 62 years. Disloc. 6 weeks.
34. Baum, "*Deutsche Zeitschrift*," 1880, vol. xiii, p. 177; artery and vein. Lig. of axillary (possibly double).

#### D. Disarticulation at Shoulder.

35. Jünken, "*Arch. für klin. Chir.*," vol. x, p. 313; artery. Unsuccessful attempt to apply double ligature; recovery.
36. Bell (Malgaigne and Callender). Death.
37. Ledentu, "*Bull. de la soc. de chir.*," 1877, p. 187; artery. Disloc. recent; death.
38. Bellamy, "*Lancet*," 1880, ii, p. 260; artery; 55 years. Disloc. 7 weeks; death.

#### E. Recovery without Operation.

39. Desault, "*Oeuvres chirurgicales*," vol. i, p. 380; 60 years. Disloc. 1½ month.
40. Malgaigne, *loc. cit.*; 44 years. Disloc. 2 months.
41. Anger, "*Bull. de la soc. de chir.*," 1878, p. 122; 54 years.
42. Nélaton, II, *Ibid.*

43. Agnew, "*Phila. Med. Times*," 1873, p. 721 ; 60 years. Disloc. 6 weeks.

44. Sands, N. Y. "*Med. Record*," 1860, p. 45 ; 84 years. Disloc. 7 weeks. Autopsy in the proceedings of the New York Surgical Society, May 26, 1885.

# ON THE TREATMENT OF EPIDIDYMITIS BY OIL OF YELLOW SANDAL WOOD, AND ON THE MODE OF ACTION OF THAT OIL.

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THERE is a general consensus of opinion that sandal oil and other substances of that nature exert a beneficial influence upon gonorrhœa; and it is believed they act through the medium of the urine. Ricord's observations have led him to the conclusion that copaiba acts in this way. He supposes that when taken into the system it becomes excreted by the urine in some mysteriously altered form, and during micturition comes into contact with the mucous membrane of the urethra, acting as an injection. The correctness of this view is open to question.

It is based upon three cases. In these he seems to have forgotten the "*ceteris paribus*" and compared the part of the urethra washed out repeatedly every day by the copaiba charged urine with that part which was not washed out at all by either urine or simple water. (In those cases where the discharge has been allowed to remain in contact with the urethral surface the aggravation of the disease is notorious). He leaves unexplained the records of the unsatisfactory effects of using copaiba charged urine as an injection. Also, he does not prove that if the copaiba is changed in the urine that it is not already similarly changed while in the blood, i. e., that the mysterious change in the copaiba takes place in the kidney and not in the liver or elsewhere. Finally, he does not prove that if the copaiba undergoes the necessary mysterious change while yet in the blood

it does not get as near to the seat of mischief while circulating through the capillaries of the urethral mucous membrane as while passing with the urine through the urethra. A better explanation of the facts observed concerning the influence of copaiba is that it acts in two directions at once; in the first place, while circulating in the capillaries of the urethral mucous membrane and, in the second, while passing with the urine through the urethra. This is the way I believe copaiba acts, and this is the way I believe oil of sandal wood acts in checking gonorrhœa.

Having a patient with a swelled testicle from gonorrhœa, and finding all sorts of ordinary measures were of little use, I cast about for some means of hastening recovery, and in a conversation with Mr. C. B. Keetley he let fall the suggestion of sandal oil. This was accordingly tried, and with very excellent results. The patient improved rapidly and in a week was practically well, there being no tenderness on pressure and but little enlargement.

In the second case in which I tried it, it answered equally well. In this the patient had been under treatment for about three weeks before coming under my care and was surprised and pleased with the apparent immediate improvement.

In the third case the patient was first seen when the inflammation was acute and the testicle as large as one's fist. In ten days he was up and about wanting to begin training for a bicycle race.

In the fourth case an officer in the army, having grown impatient with his tardy progress, came to me, and was, in his own opinion, well within seven days. Upon a subsequent occasion he again suffered with swelled testicle, came to me, and was put on the sandal oil, improved rapidly for three days, and then, wishing to avoid some military duty, applied to be put on the sick list. The army surgeon insisted upon treating him or else refused to put him on the sick list, so the sandal oil was discontinued and some other means substituted. He grew rapidly worse and in a fortnight came to see me again, improved rapidly, and got well by taking the sandal oil and pouring the other physic down the sink.

These results, obtained in a trial undertaken without any pre-

conceived theory or prejudice, encouraged me to use the sandal oil in gonorrhœal rheumatism, and this I have done in two cases, with the best results. In the first case I tried many things for three weeks without causing the least improvement. Immediately upon giving sandal oil the improvement began and recovery rapidly became complete. In this case I had tried salicylate of soda in full doses without effect.

In the second case I gave the sandal oil immediately on the appearance of the rheumatism in the ankles, and all symptoms were gone in two days.

I have given sandal oil in several cases of subacute prostatitis and though these cases all did well and rapidly recovered, other means were used in addition, and cases usually do well without sandal oil.

In one case I attempted to prevent the formation of a gonorrhœal bubo by giving sandal oil, but not successfully.

Such is my experience of sandal oil in the treatment of the complications of gonorrhœa. Though not sufficient to prove much, it has left a very strong impression upon my mind that it stands a long way ahead of any other remedy for treating "swelled testicle" and gonorrhœal rheumatism.

It may be as well to add that in cases of long standing gonorrhœal rheumatism it would be unreasonable to expect recovery in a few days under sandal oil. The best results may be hoped for in cases where this treatment is begun very early, and in old long-standing cases better results may be hoped for in a treatment which includes sandal oil than in one which excludes it.

## EDITORIAL ARTICLES.

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### ON THE ORGANIZATION OF THE SURGICAL STAFF IN GENERAL HOSPITALS.

The matters relating to the question of the organization of the Surgical Staff in a General Hospital have recently been brought strongly to the attention of the writer in connection with the duty of advising as to the organization of the staff of a new hospital. The most cursory attention to the subject was enough to show that this question was one of the utmost importance in its bearing upon the quality of the work done in a hospital, and upon its influence upon surgical teaching and practice beyond the walls of the institution. In the possibility, therefore, of building *ab initio* which a new enterprise afforded, there resided good reason why a comprehensive review of the whole subject ought to be made, so that those methods might be recommended which such a review should demonstrate to be of the most value when taken in connection with the special circumstances of the particular hospital.

The interest in a general review of this subject ought not to be confined merely to those connected with institutions now in their creative stage, for one cannot proceed far in an examination of already existing institutions before discovering that serious faults of organization exist in very many. It is undeniable that in many instances faults of organization are rendered less conspicuous and harmful by a superior quality of the personnel of the staff. It is also equally true that the most perfect organization may be neutralized by an inferior personnel. But neither of these possibilities presents any valid reason why perfection of organization should not still be sought for. The better the organization the better will be the work that is done, and in quantity as well as in quality will the increase be seen; while for inferior work the responsibility will be the more certainly located.

It is a mistake to suppose that the members of the Directing Boards of hospitals, or those immediately connected with the surgical or medical work of the same, are the only ones much interested in questions pertaining to the interior organization for carrying on the scientific work of the same. While it goes without saying that the first object for which a hospital is created is for the relief of the sick that fill its beds, it should never be forgotten that by the aggregation of the sick, and by the facilities for systematic investigation, observation and treatment which a hospital presents, the greatest opportunities are afforded for advancing medical knowledge. In the manner in which these opportunities are utilized every one, and especially every medical practitioner, is vitally interested. To obtain an hospital appointment is a privilege that may well be sought for by any one with the qualifications for it, but he who is honored with the opportunities which such a position affords becomes thereby a debtor to all his fellows, through the obligation which attaches to the position, to use it, not only for the immediate good of the hospital inmates, but also for the common good. The medical profession at large have a right to sit in judgment upon the favored few of their number who hold hospital positions as to the manner in which they fulfill this obligation. But further than this—and this is the point most germane to the special theme under discussion, for which the preceding thoughts have been necessary as a prelude—the medical profession, as a whole, are deeply interested in the manner in which hospital authorities organize their institutions so as to favor this broader and higher scientific work of their medical staffs. There is a special reason for an active manifestation of this interest, both in the United States of America and in Great Britain, dependent upon the fact that in many cases it is undoubtedly true that methods and practices have been adopted in public, as well as in the more private incorporated institutions, which are quite in disregard of the considerations as to the broader and more general relations of the scientific work within their walls above referred to. The rectification of such abuses must be a matter of time, but in their final accomplishment much will depend upon an enlightened consensus of opinion throughout the medical profession. As a contribution to the formation of such a desirable consensus of opinion the present discussion is intended.



A personal inspection of the methods of organization adopted in representative hospitals in France, Germany and England, as well as in the United States of America, will show decided differences to exist among them all. Each method has, of course, its history. What at present exists is the result of a process of development, influenced by the particular needs, modes of thought and social conditions existing in each country.

In France, as exemplified in the hospitals of Paris, the Government controls the hospitals, and by the complete system of centralization which exists, the entire number of public hospitals are combined to form a most important part in the arrangements for medical education provided by the state. All hospitals and other institutions for medical relief are under the direction of a board termed "*L'Administration Générale de l'Assistance Publique*," whose central office is in the center of Paris. All the appointments in connection with the medical staff of these hospitals are obtained by competitive examinations and tests called *concours*. The primary relation of all appointees is a general one, "to the hospitals of Paris." When thus first nominated, the nominees have to attend at the central office, and do duty for any of the hospital physicians or surgeons that may be absent. As vacancies occur in the hospitals they receive appointments in the order of their nomination. When the surgeons reach the age of 63, and physicians that of 65, they retire from hospital duty. Their positions are permanent, their service continuous. A small salary is paid to them; 1,200 francs yearly to those attached to hospitals centrally located, and 1,900 francs to those at greater distance, and 3,000 francs to the surgeons of the hospitals of Tenon, Bichat, Bicetre and Incurables. Each surgical service is completed by a corps of clinical assistants, called *internes* and *externes*, which positions are likewise obtained by "*concours*." The number of beds assigned to a single service will be from fifty to seventy-five, and for such a service from two to three *internes*, and double the number of *externes* will be provided. The *interne* is the immediate assistant of his chief; he accompanies him in his morning visit—8 o'clock in the morning is the usual hour for hospital visits—and himself visits the patients in the evening. The *externes* constitute a corps of junior assistants. The *externat* is an essential step to the *internat*. The *internes*

are appointed for two years, and the highest honor attainable in the competitions for prizes that yearly take place is the privilege of two additional years of *internat*. Internes receive 600 francs yearly for the first year, 700 the second year, 800 the third year, and 1,000 the fourth year. Some are also provided with lodging, fire and light; others receive 400 francs in lieu of this. In addition, a corps of hospital pupils, "*élèves stagiaires*," is assigned to each service in accordance with the regulations of the Faculty of Medicine, which require that every aspirant to the grade of Doctor of Medicine shall fulfill a certain amount of clinical pupillage in the public hospitals of Paris. The assignments of pupils to particular hospitals is made by the central board of Public Charities, already named, except that students who pass their yearly examinations with exceptional merit are permitted to select the hospital to which they may prefer to be attached.

The advantages of such a system as this are very great. As a matter of organization it is simply perfect, but it could be duplicated in its details only in social and governmental conditions that were identical with those in Paris. Out of this system was developed the great superiority which French surgery enjoyed a generation ago. It has its dangers, however, in that it tends to foster a spirit of self-satisfaction by reason of the feeling of superior merit which a successful competitive effort tends to engender in the victor in the contest—a feeling which, if widespread, tends to hamper progress and render its possessors oblivious to progress being made elsewhere. It is to be urged against the *concours* also that it is by no means an accurate gauge of the real worth, attainments, or working power of men. To this it may be replied that it is a much better gauge than that which is supplied by family or political or personal reasons that so often govern such appointments where the *concours* is not in vogue. No one who knows anything of human nature would claim that such considerations were not sometimes of weight in determining the result of a *concours* even, but still, upon the whole, it is undeniable that among younger men whose work is yet to be done, simple merit is much more likely to obtain the advancement which it deserves through the method of the *concours* than by any other method. Aside from this peculiarity of the French system, the most noteworthy feature is the solidarity of each

service. From the chief of the service to the junior *stagiaire* it is a unit, and is capable of being handled as a whole. It does not undergo disintegration at short intervals, there are no divided counsels, no interrupted work. Responsibility can always be fixed, and merit can be determined. For any line of work or observation the chief of a service has a trained corps of assistants that belong to him personally, upon whom he can rely. In this connection, too, it must be considered that the number of beds assigned to each service is sufficiently large to afford an ample and constantly interesting field for its chief, while not too great to enable him, with his corps of assistants, to personally direct the whole of it. It is in these latter matters that the most valuable suggestions as to the organization of the surgical or medical work of a hospital in such a country as the United States are to be found.

In Germany important and representative hospitals may be found under the control of the state, municipalities, and also of religious bodies. Some of its finest hospitals are those provided by the state for furnishing clinical facilities for its universities. The German method—not to go unduly into detail—is to divide the patients in a hospital into the two great classes, medical and surgical, and to entrust the direction of each class, however large the number, to a single person, there being thus to each institution a chief physician and chief surgeon (*Oberaerzte*). These gentlemen spend a portion of every day, generally the mornings, at the hospitals, and devote the remainder of their time to their private business. They have no responsibility as regards the management of the internal economy of the institution; for this a third director, a layman, is appointed. A salary is paid to these directors sufficiently large to enable an institution to always command the continuous service of the most eminent men. In cases of vacancy occurring, it is not unusual for a man to be imported from another city to fill vacant positions when men of sufficient note are not at hand in the particular city. As types of this method may be cited the municipal hospitals of Berlin (at Friedrichshain) and of Hamburg. In the former of these the surgical director receives 6,000 marks yearly, and a residence, with allowances for maintenance, and in the latter 12,000 marks without residence or other allowance. It should be ob-

served that these sums represent a purchasing power in that country to natives of nearly double what the same amount would have in the United States; and, also, that the ordinary fees for medical service in Germany are less than half as great as in this country.

To assist these chief medical attendants in the details of the treatment of individual patients a corps of assistants is appointed, the number varying, usually being determined by the wish of the chief. These are young men, graduates in medicine (the French internes are always undergraduates); they live in the institution, devote their entire time to it, and receive a salary of 200 marks per month. As a rule such an assistant is expected to spend two years in his position, then giving way to a new appointee, but there will generally be one who, by reason of having shown exceptional ability, will be retained for a longer period, with an increased salary. Such a one is known as the "first assistant," and acts as the representative of the chief, when for any cause he may be absent. This system suits well the peculiar genius of the German nation. It is notable in the large amount of material that it puts under the continuous direction of one man, who is paid outright to look after it. It enables masters in their profession to impress their personalities upon the institutions with which they are connected; favors comprehensive, long-continued, accurate and minute observations and investigations into diseases, and into methods of treatment, and is fruitful in the training up of skilled medical men. To these conditions, together with the unequalled care and wisdom displayed by the general government in fostering the medical teaching at the universities, is due the acknowledged prominence to-day of German medicine in all its departments.

The method is open to the objection that the chief and responsible attendant sees but little of the individual patients, whose care is committed to too large a degree to the assistants. In mitigation of this it should be said that the skill and attainments of these assistants is usually of a high order, and with the opportunity that they have of consulting at once their chief in all cases of doubt or difficulty, the interests of the patients are generally safe in their hands.

In the hospitals organized in connection with the medical schools of the universities some minor modifications of this general plan may be found, but the method in its essential principles is retained.

Coming to the prevailing English system, taking the chief hospitals of London as types, an entirely different method of organization is found. The multiplication of individual hospitals is much greater, though this by no means involves a corresponding increase in the total hospital accommodation afforded. The tendency to the establishment of institutions devoted to the treatment of special classes of ailments is very marked. There is no central organization or general administration by which a harmony and economy of work may be secured. With the three exceptions of the old endowed hospitals of St. Bartholomew, St. Thomas, and Guy, they are dependent mainly on voluntary contributions of the charitable for their support, which they secure by appealing to the sentiment of the wealthy classes, and in order to make this appeal successful they are obliged to magnify the purely charitable character of their work; no payments for treatment are required from their beneficiaries, and, although the charity of these hospitals is confessedly abused by large numbers of persons who are able to pay for their treatment, the peculiar basis on which these institutions are sustained, and their attitude as rival claimants for the donations of a charitably disposed public, is such that their managers find themselves unable to check this abuse.

Founded as institutions for the dispensation of gratuitous medical relief, there was reason that they should look for the co-operation of the medical profession to furnish the needed medical attendance without salary, as its contribution to the general charity. This expectation was fully met, and at no time has any difficulty ever been experienced in securing the unpaid services of the required number of medical men for these institutions.

On the contrary, it has come to be the case that the only avenues to high professional position are found in these hospital positions, and hence they have become prizes to be sought for with the greatest eagerness. To some extent, at least, the great multiplication and subdivision into specialties of London hospitals is believed by writers upon the subject to be due to the pressure of ambitious men for hospital facilities and appointments which previously existing institutions have not been sufficient to gratify. That to a hospital connection should be attached so much importance by medical men is owing, in the main, to

three causes: first, the opportunities for professional observation and experience that the wards of a hospital afford; second, the especial prominence and influence among his fellows of the profession that a medical man may gain if he be permitted to use his opportunities for original research and for teaching; and, third, the increased public acquaintance and the certificate of professional merit that an hospital appointment confers. It is in the combination of medical teaching with the duties of attending the sick in the wards that the greatest amount of advantage is derivable from a hospital connection. Hospital authorities have recognized this, and, by affording such facilities to the gentlemen composing the medical staffs of the institutions under their care, have sought to attach to these medical appointments in this indirect way a tangible compensation for the services required. The interests of the patients are likewise believed to be advanced by encouraging medical teaching in connection with their treatment, since each case is more likely to receive careful attention and to be thoroughly investigated, and the action of remedies to be more minutely weighed and watched under the publicity that attaches to medical teaching. As the result of these considerations, in all the larger general hospitals of London systematic medical teaching is carried on.

The number of patients that are assigned to the care of one physician or surgeon varies from twenty to one hundred according to the size of the hospital; the number not being determined so much by the amount of work to be done, as by the number among whom the honor of appointment must be divided. It happens, therefore, that nearly, if not quite, as many gentlemen will be found dividing among themselves the care of 150 or 200 patients in the smaller institutions as are found sufficient to care for three and four times as many in the larger ones.

The physicians and surgeons of a London hospital visit their wards daily, and make a personal visit to each patient. Their work is made more onerous, and the number whose care one man might direct is restricted by the peculiar system of assistants that has grown up in these hospitals. From a desire to extend the benefits of hospital training to as many as possible, a large number of assistants are appointed, and the term of service of each made quite brief. These include, first, a corps of resident assistants, recently qualified medical men, called

house surgeons or physicians, who are responsible for the care of the patients in the intervals between the visits of the attending staff; in most of the hospitals the term of service of the house staff is but six months; in a very few only is it as long as twelve months; as a rule rooms and commons are enjoyed by the house staff of a hospital in lieu of other remuneration. Second to the house staff is a more numerous body of assistants, known as dressers: these are medical students, somewhat advanced in their studies; these look after the details of the treatment and of the dressings of particular patients that are committed to their care; the dressers usually hold their appointments without salary for from three to six months; in some institutions, indeed, the dressers pay for the privilege of holding their appointments.

Under this system a member of the attending staff is subjected to the necessity of constantly educating new assistants, only to lose them as soon as they have begun to be of value to him. Much of his own energy must be directed to watching and educating his subordinates, and he is compelled constantly to give an amount of time and labor to the details of his cases, which, under a different system, could be safely relegated to his assistants. Strangers view with surprise the personal attention to routine details of dressings which the most eminent and distinguished men constantly give in the wards of these hospitals.

Yet another feature of the organization of English hospitals are the so-called Assistant Surgeons and Physicians. These are younger medical men who attend to patients who apply for treatment at an hospital, but who are not ill enough to demand the refuge of a bed in a ward. These out-door, or walking patients apply in great numbers, and for their examination and treatment special rooms are provided. In the absence of any of the chief medical attendants, one of these assistants will attend to the patients in his wards in the hospital, and in cases of vacancy occurring among the chiefs, it is usually filled by the appointment of the senior assistant. It is not unfrequently the case that young and ambitious medical men in London spend many years, devoting a large part of every day to their duties as surgeons or physicians to the out-door patients of large hospitals, without pay, in the hope of ultimately securing positions as members of the principal medical staff of the hospital proper.

What may be termed the American system of organizing the surgical and medical-staff of a general hospital has been modeled upon the English, but differs from it in some important particulars. American hospitals, like the English, are very largely under the control of private corporations, more frequently, perhaps, representing different religious bodies, in this respect differing from those of England. Though often partly endowed, the greater number of them are to a large extent dependent upon the voluntary contributions of the charitable, supplemented by sums received from patients who are able to pay something for their treatment, and in some cases, by subsidies from the state or municipal treasury. There are also many municipal and county hospitals that are of importance.

The English idea, that the honor and general professional advantage arising from a hospital connection was sufficient to make such a connection desirable, even without salary or fees of any kind, has had sufficient weight to enable managers or governors of hospitals in America generally to secure the services of able surgeons and physicians, without pay, to direct the treatment of the patients in the wards of the institutions under their management. In many cases, indeed, as the result of the necessity for pleasing different elements in a community, or in order to avoid any appearance of partiality, or as the result of social or political pressure, the managers of hospitals have felt themselves obliged to provide more medical men with places than the needs of the patients required. Two classes of appointments have been created in order to meet this necessity. The one class is purely honorary, having no regular duties or responsibilities, and involving but little more than the publication of the names of the incumbents in the list of the officers of the institution. To this class is given the name of the *Consulting Staff* of an hospital.

The Consulting Staff likewise opens an opportunity for an institution to secure the connection with its officary, of names which by reason of their eminence would bring strength and respect to the institution, although their possessors could not be expected to render much, if any, personal service. It affords also a position which may be conferred upon gentlemen who have served the institution actively for a long time and who may desire to be relieved from their active work



and yet not be compelled to entirely sever their connection with the institution.

The second class of appointments includes those to whom the duty of regular attendance in the wards of the hospitals is delegated. These compose what is known as the *Attending Staff*. It is in connection with the manner in which the services of this Attending Staff are rendered that is to be found the most notable peculiarity of the American system. This is the division of the staff into classes, each of which serves the hospital for a brief period, most frequently three months, and then is followed by another, after which the first may again come on duty; and so on in rotation—in some instances an attendant enjoys but one such period of duty each year. This enables a much larger number of medical men to derive whatever advantage there may be from the name of being connected with the institution, and gives a much larger number of places for the managers of the institution to fill than would otherwise be the case. In cities where there are several hospitals it not unfrequently happens that one medical man succeeds in obtaining positions in more than one, serving each in turn, and thus doubling the advantages which such a hospital connection may give. It is not probable that the American system of hospital service was originally devised to secure such ends. Its origin has rather been due to the attempt to follow the English system of obtaining medical attendance for hospitals without pay, while these hospitals have not been able to give in return those positive advantages to their medical attendants which would be considered as a compensation for regular, prolonged and continuous service, since the social conditions which are present in the United States, the classifications of physicians, the relations of physicians to the public, and the mutual relations of hospitals and the public, differ from those which exist in Great Britain.

In general, the gentlemen who occupy hospital positions in the United States are persons already in large and engrossing general practice, and their hospital service, given as a charity, necessarily occupies a secondary place in their attention. In order to make the burden of the hospital service as light as possible, the ready device of making short terms of service, rotating with terms of entire relief, was devised.

This system of multiple appointments and of short, interrupted terms of service is unquestionably detrimental to all the best interests of a hospital. Against it may be urged, with very great force, that it tends to foster superficial and hasty service, to produce confusion of treatment, to divide responsibility, to make less certain and marked the results of treatment, to destroy the *esprit du corps* of an institution, to interfere with making those accurate, prolonged and repeated observations that alone can be of scientific value, and to diminish the educational results of the institution. Neither the greatest advantage of the patients nor the full accomplishment of the possibilities of a hospital for the general good, are attainable by this method. Its only defensible *raison d'être* is the facility which it affords for obtaining the gratuitous services of prominent and busy men.

For the purpose of carrying out the details of treatment under the direction of the attending staff, the American system provides a class known as the Resident or House Staff, which is composed of young physicians, recent graduates, who desire to supplement their systematic collegiate education by residence in a hospital for a time, where they may give their services in exchange for the experience they may gain, receiving also their board and rooms in the institution. The usual term of service is one year. In some institutions this is preceded by a term of service of six months, during which they do not reside in the hospital. Owing to the peculiar shifting character of the service of the attending staff, the amount of responsibility which is thrown upon the house staff is very great, much greater than the age and experience, or rather the youth and inexperience of its members justifies.

Connected with many institutions are dispensaries for the treatment of "out-door" patients. The gentlemen who are appointed to the duties of this department likewise serve without pay, but, as a rule, they do not bear the close relation to the organization of the hospital proper that the "assistant surgeons" of the English hospitals do.

I have thought best to thus put side by side these brief statements of different methods of providing surgical and medical attendance for the inmates of hospitals, that by comparison the merits and demerits of each might appear, and that from a general review of them some practical application might be made in the line of improvements upon existing methods.

It is apparent that a root idea in the methods of hospital organization prevalent in the United States and Great Britain is that the recompense to be received by a visiting staff shall be indirect in its character, rather than in the nature of a fixed pecuniary stipend. As has been already stated, this is the natural result of the voluntary charity which our hospitals represent, and of the competition for hospital positions upon the part of medical men, occasioned by the supposed professional advantages which they confer.

It may be accepted without discussion that this idea of a non-salaried staff will indefinitely remain a controlling one, except possibly in the case of institutions richly endowed, or of those located in places where a sufficient number of persons of the required professional skill are not attainable. The fact ought not to be lost sight of, however, that these services, though nominally rendered gratuitously, are really to be paid for in some way. The idea of getting something for nothing will not be found a safe one to build on in hospital work any more than in any other field of human endeavor; and in this particular direction, as well as in all others, it will be found very surely that in the long run the amount and quality of the service rendered will be quite accurately determined by the value of the compensation received. The prime object, from the standpoint of a hospital, in the appointment of an attending staff, is to secure able, skillful, careful and assiduous treatment of the patients. The rewards which a hospital may offer in return are fourfold. 1. The prestige of the position itself. Whatever may be the case elsewhere, it is true that this really amounts to but little in the United States. The mere fact of an hospital appointment gives its possessor but little vantage in the professional race. The very multiplication of positions which the strife for them has occasioned has in itself lessened any prestige attending them. It is equally attainable by a position on the consulting staff as upon the visiting staff. This object alone would be likely to induce a tendency to bring down the amount of work done to the minimum required to enable the position to be held. The natural result is hasty and superficial work and the relegation of undue responsibility to subordinates. Short terms of service and prolonged periods of relief are proper accompaniments.

2. Opportunities for self-improvement by the study and observation of disease.

This is the most powerful attraction which an hospital position offers to the earnest and able student. In the results of the untrammelled use of these opportunities the governors and patients of a hospital are also deeply interested, for out of them must proceed a constant increase of ability and skill upon the part of those to whom the professional work of the institution is committed. It is the important contributions to knowledge that are constantly emanating from great hospitals that confer upon them their greatest prestige. It is the character of the work done in them by their surgeons and physicians that commends them to the admiration, the sympathy and the support of the public. How important, therefore that every opportunity and help for the very best work should be always and unstintedly put at the command of the surgical and medical staff of a hospital!

The first step in the direction of supplying this second source of compensation is to give into the charge of the surgeon or physician a sufficient number of patients to ensure to him continuously an adequate and stimulating field of operation, so that his interest may be maintained and his experience enriched. The number must be large enough to afford both a variety of cases and many cases of the same kind, so that he may have sufficient amount of material for comparison and for investigation, and for testing different methods of treatment, enough to occupy not only the time which he may himself be able to give, but also to command the work of younger men whom he may be able to enlist under his direction.

The number of beds which might suffice to answer all these desiderata would differ, of course, according to the peculiarities of different cases and the complexion of the cases likely to be most numerous in the particular hospital.

The number of patients whose treatment might be directed to good advantage by a single man must vary also according to the thoroughness and minuteness with which each case is investigated and its phenomena recorded, and whether they are made the subjects of medical teaching or not.

The quality and number of the assistants that may carry out the details of work, under the direction and supervision of the principal, must also be an element of very great importance, while the character

of the nurses and the arrangement of the wards as to the classification and grouping of the patients will also have their influence. Still, there is sufficient experience available to fix in a general way the size desirable for an average service in a general hospital. Without attempting to give the data on which the conclusion is based, it is enough to say that reference to both English and French experience sustains the conclusion that between the numbers of forty and seventy-five beds will be found that most conducive to an efficient and continuously interesting and valuable service.

Such a service, if the best work is desired, should form a unit in the hospital organization, of which one man should be the permanent and responsible head, in all matters pertaining to the surgical or medical care of the patients. The number and qualifications of his assistants should be subject to his control. The chief nurses, at least, should likewise be permanently attached to the service. Everything likely to interfere with continuity of service and the fixing of responsibility should be avoided. From the most inferior servant to the chief of the service, a spirit of enthusiasm in the results of that particular service might thus be fostered.

It might be questioned, especially in the United States, where methods of a diametrically opposite kind have so long prevailed, whether men of the desired ability would be willing to devote so much of their time continuously to gratuitous hospital duties, as would be required by the method now advocated. The writer, in answer to this, would say that it is probable that a very considerable proportion of the gentlemen already charged with large and engrossing private practices, who are willing to occupy hospital positions as at present organized, would find it undesirable to fill them if their duties were enlarged as recommended. That an institution might not lose the advantage of the connection of these men with it in some form, the "Consulting Staff" readily suggests itself as a desirable means.

The greater the variety of the cases that may be found in a hospital service, and the greater the professional interest attaching to the individual cases, the more will the service be esteemed as valuable by a professional man. This is the primary thing to be kept in view, therefore, in dividing the work of an institution, if it is wished to secure the

continuous, undivided and enthusiastic labors in the treatment of the patients of the class of men to whom it would be desirable to commit such responsibility. The experience of other countries, and the slight experience already beginning to accumulate in a very few hospitals in the United States, sufficiently demonstrates that, under conditions such as have been described, men of the highest skill and attainments are not wanting to fill such places, especially if the governors of hospitals give them facilities for realizing the other sources of compensation next to be briefly considered.

3. A third source of compensation is found in the opportunities which a hospital position may give to its occupant, by the publicity of his work, to extend his reputation, and especially to gain the confidence of his professional colleagues in general practice. The latter is always particularly a justifiable object of ambition, and may be especially accomplished if the hospital attendant is free to invite the profession at large to witness his work in the hospital. It is no more than right, therefore, that hospital authorities should afford every facility to its visiting staff to habitually make public clinical demonstrations in the wards of the hospital, as far as is consistent with the well-being of the patients.

4. The last tangible source of compensation to be here mentioned is closely allied to the preceding, and consists in the opportunities for disseminating useful knowledge by teaching and writing which a hospital position affords. The responsibilities in this direction attaching to hospital positions have already been alluded to in the introductory part of this paper. The fulfillment of these responsibilities brings a rich reward in increase of reputation and influence in any community. Every hospital should be a school of instruction, not necessarily where full courses of systematic instruction leading up to a degree in medicine are given, but all the same a practical school, in which, to as full an extent as possible, medical teaching should be carried on. The combined effect of all the conditions which have been enumerated will be, not only to supply to a diligent and earnest student rich materials, out of which to make valuable written contributions to the science and practice of medicine, the results of personal observation and original research, but also to stimulate him to the performance of such work, a

work that will reflect credit upon the institution from which it emanates quite as much as upon the individual worker.

There remains for brief consideration the question, what system of assistants will be most likely to promote the welfare of the patients, carry on the work of a hospital most economically, and render the labors of the principal medical attendants most efficient and least onerous?

The work of a principal member of the visiting staff would be advantaged, and could be extended if there were associated with him an assistant who understood his methods and shared in his aims, and whose professional attainments were of a character to enable him to carry on the work of his chief during any necessary absences, as well as to lighten his labors by taking charge of cases that might be delegated to him in the ordinary course of work. To him, also, could be delegated the duty of directing the necessary work of an out-door, or dispensary department, if such should exist. Since such an assistant would be the direct representative and coadjutor of his chief, the privilege of nominating him should be delegated to the chief and the term of service should be at the pleasure of the same officer, the Board of Governors simply reserving the right of confirming the nomination before it should become a finality. For the completion of the organization of each service, in addition to its chief and his principal permanent assistant, there will be required still a certain number of young medical men, whose position, while it is that of pupils, the object they seek being experience and practical education, is still one of responsibility and importance, since under the direction of their superiors the details of investigations, of observations, of records, of dressings, of treatment, must be carried out by them. Frequent changes in the personnel of such a staff, either by rotation of duty among those already resident in a hospital, or by short terms of service and new appointments, would be quite subversive of the thorough and continuous work, and the highest efficiency of each particular staff which the interests of the institution as a whole demand. It is true that by this method a larger number of individuals would be enabled to gain some practical experience that would be of value to them personally, but this would be at the expense of every other interest involved. Un-

doubtedly methods of clinical teaching might be devised that would accomplish as much in the way of instruction, without trenching so dangerously upon the efficiency of the responsible staff of assistants. The French system of *Externes and Stagiaires* is suggestive in this direction. The English system of Dressers is susceptible of being developed so as to fully meet the case, provided a greater degree of permanence and responsibility were given to the members of their House Staff. Under the designations of Junior Assistants, Clinical Assistants, Clinical Pupils, Dressers, or whatever other term may be devised, it is quite possible to attach to each service as many students or young practitioners as the size and character of any particular service may warrant. The term of service of such pupil-assistants may be as brief as their own convenience and wish may dictate, or as long as the scheme of medical instruction in accordance with which they are working may require.

The number and length of service of the real clinical nucleus, the responsible House Staff or *Internes*, is a matter of more importance. For the adequate discharge of the work of each service of the size which has been recommended, averaging perhaps sixty beds, a staff of at least two internes would be required, three would be better. Appointments to these positions should be by competitive examinations and tests of a practical character open to all comers. The full value to the hospital, as well as to the chief of the service to which these assistants are to be attached, cannot be obtained by a short service. A term of two years suggests itself as a desirable one. This might be divided into a preliminary period of six months, during which the appointee need not reside in the hospital, but should report daily at a stated hour, to be entrusted with junior duties, and to serve as an assistant to the residents proper, while he is being trained to assume more responsible duties. This should be followed by a period of one year of actual residence in the hospital, rooms and commons being provided by the hospital. This is a period of constant and unremitting attention to the detailed duties of ward work. At the expiration of this period the services of these men, through the training and experience which they have had, has become of some value to the institution. To let them go now and fill their places by new and raw men, entails not



only increased care and friction in the work of the hospital, but a real pecuniary loss in the more prolonged residence of patients and the waste of material used in the treatment of patients through the inexperience of new incumbents. It is not improbable that a real saving in the expenses of a hospital would be effected by the payment of a sufficient salary to its senior internes to induce them to prolong the term of their duty in the hospital. A further service of six months, with a small salary, in addition to their rooms and lodging, would complete the full term of two years. Meanwhile, by a proper alteration in the time of making new appointments, the service would never be without the presence of men of considerable training and experience.

This plan contemplates that the young man who occupies a position as interne shall pass through all its grades in the same service, to the full success and development of which he renders his continuous work. He is trained in the views and methods of the chief of the service. he assists him in his researches, he has an opportunity of winning a confidence and friendship that may be of great advantage to him in his after-career. It is safe to assume that to such positions men of the highest character and most thorough training would be attracted.

In conclusion, it may be said that there is much in the condition of professional affairs in the United States at the present to encourage the discussion of such questions as this. Though the changes which the past fifteen years have witnessed in many matters connected with medical education and practice have been very great, as yet everything is still in a plastic state. Especially in matters connected with hospital organization and the relation of hospitals to medical education are there evidences of dissatisfaction with past methods, and a desire for improvement. Perhaps nothing is contributing more to this than the advances which have been made in surgery, and the demands for a more thorough training and a greater attention to matters of minute detail upon the part of those upon whom the surgeon must rely for assistance in carrying out his work. Fields hitherto closed to operative attempts are now confidently and safely entered into, and procedures formerly uncertain and perilous in their nature are now surely conducted to undelayed recovery, provided in the course of their execution the requirements of an exact experiment in natural science are

complied with. The constant supervision of the same directing mind and the most perfect familiarity with the objects and methods to be adopted upon the part of all sharing the work have assumed an importance never before existing. While it is true, indeed, that the considerations which have been urged in the foregoing pages are of importance in the organization of the purely medical as well as the surgical work of a hospital, it is especially in connection with the latter that they are urged.

LEWIS S. PILCHER.

## INDEX OF SURGICAL PROGRESS.

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### General Surgery.

I. DEATHS FROM ANÆSTHETICS IN 1884. BY ERNEST JACOB, M. D. Nine deaths from chloroform; in one case the operation had not been begun, and in all it was trifling.

One death from A. C. E. (mixture of alcohol, chloroform and ether) by syncope; the heart pale, and the kidneys full of abscesses.

One death from ether, preceded by chloroform, there being albuminuria and double aortic disease; asphyxia, not syncope.

Three deaths from methylene, one after three minutes' inhalation of ten minims only, the patient being 23.

Five deaths from ether, the operations in all cases being very severe, and the patients much reduced.—*Brit. Med. Journ.* 1885. May 2.

A. F. STREET (Westgate on Sea.)

II. ON THE PROLONGATION OF THE ANÆSTHETIC EFFECTS OF COCAINE WHEN SUBCUTANEOUSLY INJECTED. By Dr. J. L. CORNING (New York). By experiment the author has demonstrated that, if the circulation in an extremity is arrested by an elastic tourniquet, as an Esmarch's bandage, applied about five minutes after the subcutaneous injection of a solution of cocaine muriate, the local anæsthetic effect of the cocaine is both intensified and very much prolonged. If the injection is made after the exsanguination and compression, there is little diffusion of the anæsthetic, and consequently a restriction of the zone affected by it.—*N. Y. Med. Journ.* 1885. Sept. 19.

III. CONTACT AND AIR INFECTION IN PRACTICAL SURGERY. By Dr. H. KUMMELL (Hamburg). In consideration of the favorable results achieved of late years by operative surgery with the greatest variety of strong and weak disinfectants and even without them at all, K. asks and attempts to answer the following questions:

Do we really need at the same time toxic antiseptics for securing perfect disinfection?

Are antiseptics really the active factors in the results of surgery?

Is there any quick and surely effective antiseptic?

What significance has the air in wound-infection?

As K. puts it, wound infection may occur in two ways, either by the hands, instruments, sponges, etc. touching the wound (contact-infection), or by atmospheric germs

falling on the wound (air-infection). K. endeavors to approach the subject by experimenting under conditions similar to those in practice. He therefore gave less attention to particular micro-organisms from pure cultures than to the ordinary mixture of many kinds as they surround us.

His experiments were so arranged that the separate articles to be examined—hands, instruments, sponges, bits of soft parts from wounds, air and liquid—were brought into relation with Koch's culture material and the development of germs awaited.

An antiseptic or any specified method of disinfection was only considered successful where no bacteria colony of any kind—neither the common mould fungi and putrefaction germs, nor the so-called pathogenic forms—developed.

Experiments with polished instruments taken from the case showed that placing them for 2' in 5% carbolic acid did not stop the development of fungi and bacteria, that even previous brushing with 5% carbolic and remaining 6' in the solution did not in all cases secure perfect disinfection. Similar experiments with 3% carbolic yielded still less favorable results. Subjecting the instruments for 10' to 5% or 3% carbolic regularly produced complete disinfection. Subjecting them 6' or even 10' to  $\frac{1}{10}\%$  sublimate did not in most cases prevent the development of a number of colonies; solutions of peppermint, turpentine, white pine or mustard oil 1:500; peroxide of hydrogen or 5% potash soap sufficed in only a few instances to disinfect instruments lying in them 10 to 15'.

Used but carefully cleansed instruments, not exactly polished ones, were still less readily disinfected. After 15' long subjection to 5% carbolic or  $\frac{1}{10}\%$  sublimate, instruments used in dissecting lead to the development of abundant fungi and bacteria colonies.

According to K.'s investigations the more or less rapidly achievable disinfection of an instrument depends, next to the polished character of its surface, on its form. Ribbed forceps, four-pronged hooks are e. g. much harder to free of germs than smooth knife blades. A series of experiments carried out on such easily disinfected instruments—scalpels from an etuis—yielded the following results: A scalpel left for 15 or 5' in 3% carbolic was free from all organisms, not so if left only 3'. A 5% carbolic sufficed in 15, 5 or 3'. A  $\frac{1}{10}\%$  thymol sufficed in 15', but was entirely inefficient in 3 or 5'. Chlorine water for 15, 5 or 3' was effectual, after only 1', however, a mould fungus developed. Sublimate  $\frac{1}{10}\%$  did not stop all organisms in 2, or 15'.

For quick and certain disinfection of instruments, K. finds it best to scrub them with warm water and soft soap, and then place them in an antiseptic solution. The latter is not essential under favorable conditions and in a well arranged operating room—otherwise it is necessary.

Dissecting instruments after the above preparations could be completely disinfected by 1' subjection to carbolic, sublimate or chlorine water. Other disinfectants are not as sure. A current of steam sufficed in 5 to 10', according to the character of the instruments.

As to sponges he concludes that even when soaked with stinking, putrid material they can be disinfected in 3—4'. Sponges saturated with blood or cadaverous filth or used in operations on phlegmonic or diphtheritic patients could not be freed from bacteria by half an hour's subjection to carbolic or sublimate, nor by a much longer subjection to other disinfectants. On the other hand, thorough washing with warm water and potash soap and subsequent subjection for one to two minutes to 5% carbolic, chlorine water or  $\frac{1}{10}\%$  sublimate, always sufficed.

Lint and compresses, after previous treatment with warm water and soap could be perfectly disinfected by dipping in any of the customary antiseptic solutions. Thoroughly washed and dried compresses kept in clean boxes have but to be wrung out in carbolic, sublimate or chlorine. Likewise good absorbent cotton.

Sublimated cotton, gauze and sacks of moss, especially after lying a long time, occasionally produced fungi and bacteria in culture-gelatine.

Raw catgut, even the heavier sorts, if not in too thick layers, is complete after one hour in  $\frac{1}{10}\%$  sublimate. To be doubly sure, K. suggests six hours for the lighter and twelve for the heavier strands, and preservation in pure alcohol with a little glycerine.

Silk he sterilizes by preserving in  $\frac{1}{10}\%$  sublimate. The hands are the most difficult to disinfect. He seems to prefer, after cleansing with the soap and water, 5% carbolic or possibly chlorine water.

Bits of muscle, fat and connective tissue from fresh wounds—the wound having been washed or irrigated during the operation with sublimated solutions—developed bacteria in culture-gelatine or agar-agar. In one out of three cases where only sterilized water was used the same experiment produced no organisms, in the other two it did.

As to atmospheric infection, he separates the respiratory from the surrounding air. Experiments with five persons—forced expiration through properly closed flasks containing sterilized gelatine—developed no organisms. Another series of experiments with inverted tubes and glasses showed that even coughing and forced expiratory efforts likewise gave negative results—except where particles of saliva were carried along. He, therefore, excludes wound-infection by respired air.

With regard to the surrounding air he concludes that it is practically impossible to make any atmosphere perfectly germ-free. Some very interesting experimental attempts in this direction are described. A room all parts of which have been cleaned with soap and water was found to contain fewest micro-organisms. K. has had the walls of his operating room polished smooth and coated waterproof; corners were rounded; cracks and irregularities so far as possible avoided. The continuity of the walls is only broken by two bronzed iron holders for irrigating fluid. Wood is almost excluded. All necessary objects are of glass, porcelain or marble with wrought iron. The instrument case, made wholly of glass plates, is sunk deep into the wall and tightly closed by iron doors. Floor of polished material. Before each operation the room is soaped and washed with a sponge on a pole. The stove ought to

be replaced by some smooth-surfaced heater.—Rept. of Germ. Surg. Cong. in *Centbl. f. Chirg.* 1885, No. 24. W. BROWNING (Brooklyn).

## Operative Surgery.

I. LIGATURE OF THE FIRST PART OF THE AXILLARY ARTERY. By M. WALTER RIVINGTON (London). The author in a note suggests ligature of the first stage of axillary by making an oblique incision over the line of apposition of the deltoid and pectoralis major, simply separating the two muscles from each other by retractors. To obtain more light the oblique incision may be shortened and a transverse incision added, dividing the skin and fascia at the lower border of the clavicle, and separating the fibres of the clavicular head of the pectoralis major from their attachment to the bone. The triangular flap of skin and fascia and the head of the muscle can then be turned down, without interfering with the nerve supply. By using the handle of the scalpel the edge of the pectoralis minor may be defined, and the artery may subsequently be cleared and tied in any part of the space between the subclavius and the lesser pectoral muscles. The cephalic vein is held aside with a blunt hook.

In a case in which he proposed distal ligature, but in which operation was refused, he observes "if ligature of the axillary had failed, I should have tried lifting the subclavian or innominate with an aneurism needle sufficiently to arrest pulsation, retaining the needle in position for a few hours to enable the blood to coagulate in the sac, then withdrawing the needle and closing the wound altogether.—*Brit. Med. Journ.* 1885. May 23. W. THOMSON (Dublin).

II. MICKULICZ'S OPERATION FOR PARTIAL EXSECTION OF THE TARSUS. By Dr. A. G. GERSTER (New York). The principle of the operation is as follows: In cases where the heel is denuded of its integument Mikulicz thought that the length of the limb could be preserved and made available for motion without the assistance of complicating apparatus if the calcaneum and astragalus were removed and the anterior portion of the foot saved and brought in contact with the tibia and fibula. The first incision is made almost in the same manner as for Pirogoff's and Syme's operation, cutting down to the bone, beginning a little anterior and below the malleolus on one side, carrying it across the planta pedis, to the corresponding point upon the other side. The incision is then extended up to the center of the malleolus and carried round the leg behind, corresponding to the insertion of the tendo-Achillis. Through this latter incision the posterior aspect of the ankle-joint is exposed and the same is entered and dissected up until the head of the astragalus is denuded, and then the astragalus and calcaneum are severed out of their last connections in Chopart's joint.

When this has been done the remnant of the foot, containing the scaphoid, the cuboid, the cuneiform bones and the metacarpal bones and the toes, is hanging by a flap, situated on the anterior portion of the limb, the nutrition of which is sustained through the dorsalis pedis artery.

The tibia and fibula are then sawn through the malleoli, and also the cuboid can

scaphoid bones are separated from the soft parts sufficiently to permit the saw to be carried through them on a vertical plane. In this way are left two rather extensive bony surfaces, which are brought together and rendered immobile by driving a nail slantingly through the scaphoid into the spongy portion of the tibial epiphysis. Finally the cutaneous edges are united by a continuous catgut suture and the limb swathed in an antiseptic dressing.

Dr. Gerster presented a patient upon whom he had performed this operation on account of disability and deformity, resulting from previous exsection of tuberosity of calcaneum and removal of soft parts of the heel for epithelioma. At the end of the operation the bones were fixed in apposition by a long nail driven through the remnant of the scaphoid bone into the tibia. Primary union was secured under antiseptic dressings. At the end of two weeks the nail was withdrawn, no inflammatory reaction having occurred about it. Patient began to walk about very soon. By the aid of a shoe with an elevated heel now walks very comfortably and with a good deal of elasticity.—*Proceedings of the New York Surgical Society*, Meeting of April 14, 1885.

III. ON RESECTION OF THE THORACIC WALL FOR LARGE TUMORS OF THE CHEST. By Prof. MAAS (Wurzburg). On account of osteochondroma of the ribs reaching on the posterior and lateral wall of chest and abdomen, from the scapula to the crista ilei, in a strong man æt. 42, M. had to remove  $11\frac{1}{2}$ -centimetre long pieces of the ninth, tenth and eleventh ribs with pleura. Abdominal cavity not opened; pericardium and retracted left lung laid bare. At the moment of opening the pleural cavity the pulse sank from 84 to 60 (vagus irritation). Spray of aluminum acetate. The enormous wound was closed with series of sutures; places left open for discharge of secretions, but no drainage tubes. Astonishingly rapid convalescence. Some dyspnoea on the first day only; by the fifth, vesicular breathing could be heard as far as seventh rib, and by the eighth, over the full extent—at which date only a few granulations remained of the wound. During inspiration the region of bony defect sank in over an extent of  $\frac{6}{8}$  centimetres only. M. believes the favorable course followed from not irritating the pleura with antiseptic washings. H. Fischer's case of cure suffered a severe bronchitis; Leisrink lost his from pneumonia.—Report of Germ. Surg. Cong. in *Centbl. f. Chirg.* 1885. No. 24.

IV. ON THE TECHNIQUE OF COLOTOMY. By Dr. A. KNIE (Moscow). Vitranga's statistics last year showed that gastrostomy at two sittings gave far better results than at one, owing evidently to the preservation of the fresh laparotomy wound from stomach contents. K.'s experience agrees with this. Of his last twelve gastrostomies, one died on eighth day from perforation of a blood vessel, and one on twelfth from inanition, while the others lived many months. Like favorable were three laparocolotomies at two sittings. A successful gastrostomy usually gives patient entire relief, while colotomy simply prolongs suffering. Faecal matter finds its way into the lower bowel, decomposes, leads to the breaking down of the tumor, continuous tenesmus, etc. Shinzinger severs the bowel and closes the lower end; similarly

Volkman. This, however, necessitates a single operation. K. was thus led to experiment with a view to colotomy in two acts that should include closure of the lower gut.

The fact that in spontaneous anus, præter naturalis, a point or spur forms, and that then often nothing passes into the rectum, led him to try imitating it. In this he was not successful.

He then doubled the gut at an acute angle and opened it. But this also did not produce complete occlusion, only stenosis. "If the flexed and laterally opened loop of intestine be excised and water under a high pressure injected, the greater part of it flows from the lower portion. If, however, previously a small rather long tampon of batting be introduced as far as the stenosis, the greatest pressure of the syringe cannot overcome the resistance and all the water flows from the fistula."

A third series of experiments bore on the possibility of so far stenosing the gut by a wide, well-disinfected strip of linen as to make it impermeable, without circulatory disturbance. He pulled out a loop of ileum, punctured the mesentery and sewed together the edges of the tape passed around it. The gut above was tied to the wound. Primary union, absolute occlusion, no vomiting. Dog killed on tenth day. Gut above was enormously distended. The constricting band had become completely enclosed without any reaction—no gangrene. Constricted portion of intestine was reduced to a cord and no longer distensible. The last method, therefore, seems to have promise.—*Centbl. f. Chirg.* 1885. No. 23. June 20.

V. A METHOD FOR EXTIRPATION OF HIGH RECTAL CANCER. By Dr. P. KRASKE (Freiburg). A report of attempts at devising an operation for removing these growths, which, as Volkman expresses it, are too low for laparotomy and too high for removal from outside. Kocher's excision of coccyx does not suffice here. K. worked out his method on the cadaver. Access to the upper part of the rectum is made far easier by splitting the soft parts in the middle line from the second sacral vertebra to the anus—subject on the left side—preparing off the gluteal musculature on the left as far as the edge of the sacrum, and, after excision of the coccyx, dividing the ligg. tuberoso-sacrum and spinoso-sacrum at their sacral insertion and drawing away the left edge of the wound. Still better access to the upper rectum is gained by chiseling away a bit of the lower left side of the sacrum. If the bone be divided in a line beginning on the left edge at the level of the iii posterior sacral foramen, and running in a curve concave to the left, in and down by the lower border of the iii sacral foramen and through the fourth to the left lower corner of the sacrum, the more important parts, especially nerves, are not injured, the neutral branch of the iii sacral nerve is avoided and the sacral canal not opened. The upper portions of the rectum thus become so accessible that—the cadaver in dorsal decubitus—the rectum can be amputated without difficulty and in full view, up to where it passes into the flexure. Further, this admits resection of the upper rectum with preservation of the lower end. K. tried this method on the cadaver in a case of high rectal cancer, and



then twice on the living subject. Once in a debilitated woman *æt.* 47. The cancer began  $\frac{4}{5}$  centimetre above the anus, while its upper end could not be felt. The rectum was amputated with avoidance of the external sphincter, where it was wholly surrounded by peritoneum. Course afebrile. Second case in a man *æt.* 37. Its lower end,  $\frac{12}{15}$  centimetre above anus, could just be reached with the finger. A 10 centimetre long portion below was spared, though divided posteriorly. The gut was pulled down and the ends two-thirds united. The lower posteriorly open portion was closed later by a plastic operation.

For the purpose specified he believes this is a good method, though it might be modified and improved—in necessary cases the removal of more bone and opening of the sacral canal would be permissible.—Report of the Germ. Surg. Congr. in *Centbl. f. Chirg.* 1885. No. 24. W. BROWNING (Brooklyn).

## Head and Neck.

I. ANEURYSM OR ANASTOMOSIS ON THE HEAD, TREATED BY LIGATURE OF THE COMMON CAROTID AND SUBSEQUENT LOCAL LIGATION. By G. B. FERGUSON and G. A. CARDEW (Cheltenham). Girl, *æt.* 19. Pulsating swelling at back and right side of head, involving right ear. First stage had been a *nævus*. Pulsation strongly marked. Severe hæmorrhages had frequently occurred. Common carotid tied. Immediate result, almost total disappearance of tumor; but soon after slight pulsation returned. Six months later collateral circulation established, and tumor again began to grow. Hæmorrhages returned. One half of the tumor ligatured with a silk thread in the usual manner. A few days later posterior auricular ligatured on a pin. Two months later other half of tumor ligatured, and again six months later the whole of the tumor once more subcutaneously ligatured. Eighteen months after it was evident that a substantial cure had been effected.—*Lancet.* 1885. April 4. P 608. WM. THOMSON (Dublin).

II. ON RESECTION OF THE MAXILLARY JOINT AS A REMEDY FOR ANKYLOSIS VERA MANDIBULÆ. By H. R. RANKE (Groningen). Patient was a boy *æt.* 10 years, who, in consequence of otitis, had acquired a bony ankylosis of the jaw on the left six years previously. This half of the jaw was greatly retarded in growth; the chin so fallen back that the lower row of teeth stood much behind the upper.

March 9, 1885, R. performed aseptically Bothin-König's chisel resection of the joint, so modified and executed as to include a single incision along the lower border of the zygomatic arch and avoid both temporal artery and facial nerve. The coronoid process was removed at the same time. Active and passive opening of the mouth was possible immediately after the operation. Primary union of the wound.

R. had done two similar operations six years before, one on a young man with a bony ankylosis on the right, from being run over in early childhood. A small piece of bone necrosed after the operation. A functionally good and lasting result was achieved. The other operation, on a girl *æt.* 16, was more complicated. Complete immobility had followed acute osteo-myelitis of the left side of the jaw, in her fifth year. The old sequestra were first removed; later the bony adhesion to the base of

the skull was resected and finally a span of bone from zygomatic arch to jaw was taken out of the musculature. Good and permanent result functionally.

From his experience resection of the joint has not the danger of recurrence that resection of continuity has. He further recommends König's operation as modified above. Resection of the coronoid process he would limit to cases where, after removal of the articular process, the coronoid is an impediment to opening the mouth.—Rept. of Germ. Surg. Congress in *Centbl. f. Chirg.* 1885. No. 24.

W. BROWNING (Brooklyn).

## Chest and Abdomen.

I. PERICARDIAC PARACENTESIS BY FREE INCISION AFTER RESECTION OF RIB. By Dr. C. GUSSENBAUER (Prague). The author presented before the Society of German Physicians of Prague a child *æt.* 13 years, a subject of acute osteo-myelitis, upon whom he had successfully performed paracentesis of the pericardium on account of purulent pericarditis. The fifth rib was resected and the pericardium extensively incised. Pus flowed freely from the incision. The pericardium was fixed with catgut sutures to the edges of the cutaneous wound, the serous membrane being washed with a thymic acid solution. The heart could be felt immediately under the finger. A small fistula still remained when the child was exhibited.—*Arch. Pediat.* 1885. August.

II. PARACENTESIS OF THE PERICARDIUM. By Dr. E. A. MIKHAILOVA (Moscow). Female, *æt.* 35. Had suffered for years from cardiac palpitation. Fell from a considerable height. Was unconscious for a day; on recovering consciousness suffered from giddiness and intense attacks of palpitation on slightest exertion. Increased area of dullness over region of heart. Heart sounds feeble but normal. Symptoms of heart oppression, as evidenced by dyspnoea, cyanosis of lips and nose, steadily grew worse. At end of third week aspiration with Dieulafoy's apparatus was performed in the fourth intercostal space, and 120 cubic centimetres of fluid drawn off. The first 80 cubic centimetres consisted of pure cream-like pus, the remaining 40 almost entirely of blood. Immediately after the puncture, the patient was in a state of semi-collapse, but on the next day there was a noted slight improvement in the subjective symptoms. On the day following the cardiac dullness reached up as far as the clavicle, the pulse became scarcely perceptible, the dyspnoea extreme; the lungs were full of mucous râles. To satisfy the vital indication, incision of the pericardium was performed. It measured about 2 centimetres in length, its spot being close to the left edge of the sternum, in the fourth intercostal space. About two fluid pounds of foetid blood-stained pus escaped. After washing out the pericardial cavity with boracic water (at 38° C.) a drainage tube was inserted, and the carbolic gauze applied. Striking relief immediately followed; the dyspnoea diminished, the pulse became regular and 90, the cardiac dullness normal. However, in spite of three successive subcutaneous injections of ethereal tincture of valerian, the cardiac action remained low, and eighteen hours after the operation the patient died.

At the post-mortem examination there were found fatty degeneration of the car-

diac muscle, dilatation of the cardiac cavities, considerable old fibrinous thickening of the pericardium, fibrino-purulent exudation with admixture of blood in the pericardial sac, right hydrothorax, total obliteration of the left pleural cavity, œdema of the lungs with purulent bronchitis, marantic thrombosis of the pelvic veins and of the vena spermatica interna dextra, ischaemic necrosis of the right kidney; the same, but in a less advanced stage, in the left kidney. A search for bacilli in the heart and pericardium gave negative results.—Extract by V. Idelson, M.D., from *Meditz. Obozr.* Fasc. V., 1885, published in *The London Med. Record.* 1885. Aug. 15.

III. TAPPING OF THE PERICARDIUM. By Dr. T. G. STEWART (Edinburgh). A new case, with remarks. Patient, male, æt. 17. Pericarditis, with threatened heart failure. A fine aspirator-needle introduced in the fifth intercostal space towards left margin of area of absolute dullness, and two ounces of serous fluid withdrawn. Relief. The next day, condition having become again threatening, tapping was repeated, and four ounces of blood-stained fluid were withdrawn. Marked immediate improvement, and ultimate complete recovery resulted. An examination of the literature of the subject gives 97 cases, of which 38 were successful, and 59 unsuccessful. The operation deserves recognition as justifiable in certain cases. It should be tried whenever life is imperiled by the copiousness of the effusion. It should be tried, even if the pericarditis be not in itself dangerous, in any case of considerable pericardial effusion in which the pulse threatens to fail.

What are the best rules for operative procedure?

1. Exploratory puncture should be made by means of a fine perforated needle, the needle being cautiously introduced at a point where there is absolute dullness and least likelihood of injuring the heart.

2. If the serous fluid be found, the fine needle of an aspirator should be introduced at the same point and the fluid drawn off.

3. If purulent fluid be found, either aspiration, or what is probably better, free incision, should be resorted to and the pus evacuated.

4. As to the quantity to be drawn off, opinions are somewhat contradictory. If the fluid be purulent, it is obviously desirable to remove the whole of it as speedily as possible; if it be serous, this rule does not necessarily hold. Only a sufficient quantity to give relief should be removed. It is a sound principle that in dealing with vital organs only the minimum amount of interference required should be had recourse to, and especially in cases which threaten failure of pulse is this precaution necessary. Repeat the operation rather than to adopt the method recommended by the majority of authorities, and draw off a large quantity at once.

5. At what point should the puncture be made?

It is not very important what point is selected for puncture, so long as the operation is performed with caution. Obviously wounding the heart is to be carefully avoided, notwithstanding the fact that it has been wounded, and even penetrated, without seriously bad effect. The puncture must be made where there is absolute dullness, the fifth interspace being preferable, and as much to the left of the sternum

as possible. By such a rule we most avoid risk of injuring the heart.—*Edinburgh Med. Jour.* 1885. August.

IV. CASE OF TUBERCULAR STENOSIS OF THORACIC DUCT; RUPTURE BY OVERDISTENSION OF RECEPTACULUM CHYLI; CONSEQUENT CHYLOUS ASCITES. By W. WHITLA, M. D. (Belfast). Boy, æt. 13, with previous history of bronchial catarrh and pleurisy, from which he had completely convalesced. About four weeks later suddenly attacked with a shivering fit with pain on left side above the level of the last rib. Two weeks later abdomen was first noticed to be swollen. At end of six weeks was tapped and twelve pints of milky fluid obtained. Rapid reaccumulation. Frequent tapplings, with removal of same milky fluid in each instance, which, upon chemical analysis by Professor Hay, of Aberdeen, was pronounced to be pure chyle. No loss of general weight. Final development of tubercular meningitis and death, just three months from day of first tapping. During this interval 117½ pints, or nearly 15 gallons of chyle, were removed by the various tapplings, amounting in weight to 150 pounds, nearly double that of the patient's body. Post-mortem—the tissues attached to the front of the spine in the abdomen and chest were removed *en masse* down to the periosteum, and a careful dissection of the thoracic duct made by Professor Redfern. The lower third of the duct was found considerably dilated; its walls of normal thickness, and its internal surface smooth and glistening. The middle third of the duct at its lower part was sealed with a perfect plug of fibrin, almost a half-inch in length; here minute miliary elevations were discernible; beyond this the duct was an impervious cord up as far as the extreme upper part of the duct, which was normal. Microscopic examination of the thickened lower part of the duct and of the obliterated middle third, show them to be the subject of tuberculous infiltration. At the lower end of the dilated lower third of the duct was found a distinct perforation, with smooth, non-infiltrated edges, rounded off by vital action, and evidently not made by post-mortem violence. The reporter concludes that the chyle, flowing from the radicals entering the duct from below, caused the receptaculum to dilate and finally to burst, producing a perforation through which the chyle continued to flow into the peritoneal cavity during the remainder of life.—*Brit. Med. Jour.* 1885. May 30.

V. EXPLORATORY INCISIONS IN CASES OF ABDOMINAL TUMORS. By M. TERRILLON (Paris). After alluding to the difficulties of diagnosis in abdominal affections, and the advances that have been made of late years by exploring the abdomen in cases of doubt, M. Terrillon quotes three cases in which this was done, and shows that no harm accrued from the procedure.

CASE 1. Cancer of peritoneum, death a month after the operation; the wound healed readily in a few days.

CASE 2. Ascites from cause unknown. At an early stage of the case the patient was under the care of a physician, who, after drawing off the fluid, injected the peritoneal cavity with iodine and produced a violent attack of peritonitis, but from which the patient eventually recovered. As the abdomen refilled often with a

beer-coloured fluid, which was frequently drawn off and as frequently reappeared, abdominal section was performed, on the supposition that it might be a parovarian cyst, but none was found. There were abundant adhesions of the intestines, and some uterine fibroids. The wound healed readily and the ascites did not reappear.

CASE 3. This case revealed a large gelatinous cyst of the uterus which it was impossible to remove, and the patient recovered from the wound and died about three weeks later.—*Bull. et Mém. de la Soc. de Chirurg. de Paris*. Tom XI. 1885. P 168.

W. BRUCE CLARKE (London).

VI. TREATMENT OF ABDOMINAL ANEURYSM. By Prof. LORETA (Bologna). A sailor, æt. 30. Had primary and secondary syphilis five years ago. In February, 1883, while furling a sail, felt something give way in his belly. In October, 1884, pulsating tumor found in left hypochondrium. When admitted to hospital in December a tumor was found in epigastrium and left hypochondrium, with loud bruit. Pulse hardly perceptible in femoral arteries and ceased altogether when tumor was compressed. Neuralgia in lower limbs. Regarding this as a traumatic sacciform aneurysm, probably springing by a narrowish neck from aorta or one of its branches. Loreta determined to separate the sac from its connections, and if possible close its opening out of the artery by suture or ligature; or to empty the sac, invert it and sew it up, and if neither of these proceedings should prove possible, to stuff the cavity with wire.

On December 12, an incision was made from root of ensiform cartilage to umbilicus. The sac was found united to stomach, omentum, transverse colon and liver.

It was found impossible to dissect the sac from the spleen, diaphragm and cardiac end of stomach. Hence it was impossible to trace the aneurysm down to its mouth, nor could it be compressed or emptied. The tumor was punctured by small trocars and silvered copper wire was passed in in the direction of the current of blood. As soon as the wire met with resistance the canula was removed, the end of the wire pushed in with a needle, and the puncture, together with the surrounding tissues, slightly cauterized with pure carbolic acid. A little over two yards of wire were introduced. In a month after the operation the tumor seemed quite consolidated and diminished to a quarter of its former size. The patient left bed on February 2, and was discharged as cured three weeks later. The method employed was first employed by Moore, of Middlesex Hospital, London.—*Brit. Med. Jour.* 1885. April 11. And Memoirs of the Royal Academy of Sciences of the Institute of Bologna, February 8, 1885. Sec. IV., vol. 6.

This patient has since died, but full details of the post-mortem have not been published.

WM. THOMSON (Dublin),

VII. DEMONSTRATION OF AN EXTIRPATED SPLEEN. By Baron HOROCH (Vienna). Patient was a woman æt. 34, who for a year had noticed an egg-sized tumor in the left hypochondriac region, causing pain on standing or walking. While dancing, and without antecedent pain, she was seized with nausea, and soon vomited up blackish material. Abdomen rapidly grew large and painful. She noticed that the tumor now reached farther down and to the right. Very pale and anæmic;

1,700,000 red and 26,000 white corpuscles in 1 cubic centimetre blood. A tumor was felt in the right hypochondriac and epigastric regions. Despite dulness in the iliac region a probable diagnosis of splenic tumor was made.

Extirpation by Prof. Albert 3 weeks later. Hilus of spleen was doubly constricted by false membranes and attached both to the tail of the pancreas and border of larger omentum.

The wound healed in four weeks and patient was perfectly well. Twenty-two days after the operation the blood showed 3,660,000 red and 12,000 white corpuscles to 1 cubic centimetre, an increase of nearly 100,000 red corpuscles daily. Siegel and Haack have found a similar increase in healthy individuals after hæmorrhage. The extirpated organ, 21 resp.; 24 cm. x 17 cm., showed infarction microscopically.—Report of last Germ. Surg. Cong. in *Centbl. f. Chirg.* 1885. No. 24.

VIII. RESECTION OF INTESTINE. By Dr. A. KOFRANYI. Man, æt. 50. Incarcerated hernia. Gangrenous intestinal loop in the hernial sac; resection of the same and portions of omentum. Considerable difficulty in suturing. Vomiting, coldness of the body and filiform pulse for two days after. Mortification of parts about the external wound, but no fever. Water and opium the first four or five days. Flatus passed on the third day and fecal matter on the sixth, after which the bowels moved daily. External wound closed by the twentieth day. The patient, not entirely right in his head, got up and went out on the eleventh day.—*Wien. Med. Woch.* 1885. Nos. 31 and 32.

W. BROWNING (Brooklyn).

IX. CASE OF INTUSSUSCEPTION RELIEVED BY LAPAROTOMY. By JOHN C. IRISH, M. D., (Lowell). Robust male, æt. 25; immediate cause of attack a fall from a load of hay; obstruction with gradual aggravation of symptoms for five days; localized pain felt in hypogastric region three inches to the right of median line and two and a half inches below umbilicus. Repeated cathartics and enemata brought no relief. Patient being evidently *in extremis*, laparotomy was consented to. Incision in median line from one inch above umbilicus to pubis, left rectus muscle also divided. Intestines drawn out until about fifteen feet lay upon abdomen; an ileo-cæcal invagination was found, the invaginated portion being about three inches in length. As soon as the intussusception was relieved there was a sudden rush of gas, and resumption of the peristaltic action of the intestines, followed by escape of gas from the anus, with a large, thin, feculent discharge. The intestines were replaced with comparative ease and incision closed. Patient, though exhibiting great shock during the manipulation of the bowels, rallied well and quickly. Had opiates and nutrient enemata for first three days. Bowels moved spontaneously on the fourth day. Temperature on evening of third day was 101° F., at no other time did it rise above 100°. Wound healed throughout by primary union. Patient sat up on fourteenth day.—Case reported by Dr. J. B. Heald, in the *Boston Med. and Surg. Jour.* 1885. September 3.

X. CASES OF GUNSHOT WOUND IN THE ABDOMEN. By E. ANDREWS, M. D., (Chicago). CASE 1. Wound made by a 22-calibre bullet, which entered on the linea

alba between the umbilicus and the xiphoid cartilage, traversing directly backwards. The stomach was empty. Considerable shock ensued, but no vomiting. The patient was treated by opiates and starvation. On the tenth day he passed the bullet per anum. He recovered without a sign of peritonitis.

CASE 2. A 38-calibre bullet shot passed completely through the body on nearly the same line as the previous one. Laparotomy was proposed to him, but he refused it. His stomach had no food in it at the time of the shot, but he had taken considerable beer. As he rejected the operation, he was placed on starvation and opiates and recovered without a bad symptom.

CASE 3. The patient received a 38-calibre shot which entered through the border of the cartilages of the ribs upward and to the left of the umbilicus, the bullet apparently passing close to the anterior border of the left lobe of the liver and directly towards the stomach near its greater extremity. The projectile went entirely through the body, passing out of the back at a point opposite, but two inches lower than the place of entry, and on the same side. So far as could be learned there was no food in the stomach at the time of the wound save some beer. Fifteen hours after the injury there was a slight elevation in temperature, and pressure detected a diffused tenderness of the abdomen, extending down to the iliac region on the right side. An exploratory laparotomy was done, by an incision in linea alba between xiphoid cartilage and umbilicus, with usual antiseptic precautions, the spray excepted. The inner orifice of the track of the bullet was found on the interior surface of the cartilages of the ribs, close to the edge of the left lobe of the liver, but not wounding the latter. Considerable bloody serum was sponged out, but there were no clots, and nothing like the contents of the stomach or of the intestines could be found. On drawing the left end of the stomach forwards as far as it would come without violence, no perforation could be discovered, though there were portions which could not be thoroughly searched. The stomach was slightly distended with flatus and liquid, but none of it escaped into the abdomen on making gentle pressure. If the organ was perforated, it was obviously by a valve shaped wound, which prevented leakage. The incision was antiseptically closed and dressed, and the patient treated by starvation and opiates. Immediately after the operation he vomited freely, throwing up mucus, water and bile, but no blood. Six days after the injury all abdominal symptoms had subsided, but delirium tremens had supervened. The author's observations lead him to think that pistol-shots may often penetrate the rather thick walls of the stomach without allowing any escape of its contents, while the same sized bullet traversing the intestines, which are exceedingly thin, will instantly let out the gases and other materials which are in them. In the majority of cases, the danger will be greatly diminished by laparotomy, generally performed at the linea alba. The first incision may be small, to establish the diagnosis; and if hæmorrhage or visceral effusion is found, the opening may be enlarged to enable one to tie the vessel, to sew up the perforations, or to excise ragged segments, and to clean out the effusions. The moderate exploratory incision is not of itself very dangerous, if properly performed,

but if it show escape of the contents of the intestines or stomach into the peritoneal cavity, it offers the only reasonable chance of saving the life.—*Four. Am. Med. Asso.* 1885. August 15.

XI. PENETRATING PISTOL-SHOT WOUND OF ABDOMEN; LAPAROTOMY; SUTURE OF INTESTINE; RECOVERY. By J. B. HAMILTON, M. D. (Washington). Patient, male mulatto, æt. 19, shot by a pistol carrying a 32-calibre ball. Point of entrance of missile, one inch to the right and one inch above the navel. Probe showed that abdominal cavity was penetrated. Operated two hours after injury. Six inch long incision in linea alba; abdominal cavity full of blood; spurting artery seen in mesentery; artery tied with catgut and cavity cleared of blood; intestine drawn out loop by loop for examination; eleven wounds requiring suture found in small intestine and two in ascending colon. No fecal extravasation, but a melon seed which had escaped through one of the openings was found and removed. The omentum was cut by the ball in several places, and as it was difficult to stop the oozing, a ligature was placed around the wounded mass, and it was cut off. The abdominal cavity was then sponged with solution of bichloride of mercury, cleaned and dried, and the incision closed by sutures. Patient reacted well. During first week there was troublesome tympanites and diarrhœa. Temperature ranged from 100.2° F. to 101.4°, except on evening of fifth day, when it rose to 103°. An inflammation of the right testicle complicated the case; this ultimately suppurated, requiring incision on the tenth day. During second week marked symptoms of exhaustion, which yielded to free use of whisky. On thirteenth day great tenesmus prompted rectal examination, which revealed tumor in pelvic cavity pressing against rectum. On the day following, patient's general condition being good, an incision was made into this tumor through the rectum, in the median line, about two inches within the anus. Free discharge of thin, badly-smelling blood ensued, estimated to be about three pints in amount. Patient passing into a state approaching syncope, rectum was plugged and stimulants given. Plug was removed on following day. From this time the patient steadily progressed toward recovery. He was discharged well on August 8. The bullet was not found at the time of the operation. It was passed per anum on the thirteenth day.—*Journal of the Amer. Med. Assoc.* 1885. August 22.

### Extremities.

I. CASE OF GANGRENE OF FOOT FROM OBSTRUCTION OF POPLITEAL ARTERY BY HYALID CYSTS. By Mr. H. MALLINS (Norfolk). Man, æt. 74. Seven years before admission ulcer formed on leg; last summer was treated in hospital and ulcer healed. A few weeks later the whole foot of the affected side became œdematous, and several of the metatarso-phalangeal joints suppurated. Amputation was performed at junction of lower and middle thirds of femur. The artery was found to be filled with firm clot. Gangrene of stump supervened and the patient died on fifth day. The popliteal artery presented a fusiform dilatation an inch wide and four inches long. A white matter like pus escaped, but on laying the vessel open no pus could be found. The walls of the artery were thickened, but the main bulk con-



sisted of the contents, which consisted of a mass of hydatid cysts, varying in size from a very small pea to that of a good sized raisin. No hooklets could be discovered. Dr. Spencer Cobbold declared the ectocyst to display well marked characteristics appertaining to *echinococcus veterinorum*.—*Lancet*. 1885. April 11. P. 658.

WM. THOMSON (Dublin).

## Genito-Urinary Organs.

I. CASES OF NEPHROLITHOTOMY. CASE I. By Mr. HENRY MORRIS. The patient, a man *æt.* 24, had suffered from pains in his loins ever since he was quite a boy, but during the last two years the pains had much increased, and latterly he had been quite unable to work at all. He complained of much pain in his left testicle, which had undergone almost complete atrophy.

May 10, 1884—Nephrolithotomy was performed. On reaching the back of the kidney, the kidney-tissue was cut through and the stone removed. The patient made a good recovery and left the hospital with his loin soundly healed on July 8.

He was seen in January, 1885, and states he never felt better in his life, and suffers no pain.

CASE 2. By Mr. CHARLES J. SYMONDS. The patient in question was a man *æt.* 50, who had suffered for twenty-four years from renal colic. The attacks were intermittent and lasted from a few hours to a week. During the four months previous to the operation he had been much weaker, and had at times passed enough blood to obstruct the urethra; hence the operation.

An incision was made parallel with the last rib and the stone was removed with antiseptic precautions on July 11, 1883. By July 20 the wound had quite healed, and on November 10, 1884, when the patient was last heard of, he was quite free from pain except when he over-exerted himself.—*Proceedings of Clinical Society, Lancet*. 1885. March 7.

II. CASE OF NEPHRECTOMY FOR SARCOMA. By Mr. R. N. PUGH. This case is chiefly interesting on account of the curious cause of death.

A child, *æt.* 2 years 4 months, was admitted into the children's infirmary, Liverpool. It was anæmic and emaciated and there was a tumor on the left side of the abdomen. Abdominal section was performed on January 17, 1885, and the left kidney in its capsule was removed. Vomiting came on two days after the operation and on the twenty-third the child died. The bowels had not been open since the operation. A post-mortem revealed the fact that a loop of small intestine had become strangulated in a rent of peritoneum behind the left colon. The wound left by the removal of the kidney was progressing quite favorably.—*Med. Press and Circular*. 1885. March.

III. CASE OF NEPHRECTOMY. By Mr. KNOWSLEY THORNTON. Female *æt.* 32. a cook, was admitted to the Samaritan Free Hospital suffering from pain in the right renal region, which she had had since she was 3 years old.

There was a swelling on the right side of the abdomen in the region of the kidney. The swelling was very tender to touch. Urine 1016, no pus, blood or albumen.

October 8, 1884.—Langenbuch's incision was made on the outer side of the rectus and the tumor was removed. It contained two pints of cloudy urine, which was drawn off before its removal. Several calculi were found in the pelvis, and a papillomatous growth blocking up the mouth of the ureter. The wound was soundly healed by the fourteenth day.—*Med. Time. and Gazette.* 1885. March 14.

W. BRUCE CLARKE (London).

IV. NOTES ON THE SURGERY OF THE KIDNEY. By Mr. LAWSON TAIT (Birmingham). Notes of nine cases of operative attacks upon the kidney by the author, during the year 1884. The first case was of nephrectomy of right kidney on account of obstructed ureter. Female, æt. 32. At end of six weeks the remaining kidney was secreting 50 ounces of healthy urine daily. Patient made a perfect recovery.

CASE 2. Female, æt. 19. Urinary fistula, the sequel to a ruptured kidney cyst. Nephrectomy. Easy recovery; gradual increase in quantity of urine secreted up to 30 ounces daily, the point reached at time of discharge six weeks after operation.

CASE 3. Female æt. 45. Nephrectomy for supposed solid tumor of right kidney. Operator believes he made a mistake in not exploring the tumor before attempting its removal, for not until the tumor was nearly enucleated did he find it to consist of a series of abscesses. Death from shock about twenty-six hours after operation.

CASE 4. Female, æt. 38. Nephrotomy, and drainage for relief of abscesses of right kidney. Temporary improvement.

CASE 5. Female, æt. 22. Right kidney movable, enlarged and painful. Diagnosis made by abdominal section and exploration. Left kidney being healthy, the right was extirpated. Easy recovery. Subsequent perfect health.

CASE 6. Female, æt. 25. Nephrotomy with removal of large branching calculus from right kidney. Rapid and satisfactory recovery.

CASE 7. Female, æt. 52. Nephrotomy with removal of large calculus from pelvis of right kidney. Rapid recovery, with practically no suppuration.

CASE 8. Supposed cyst of mesentery. Laparotomy for removal. After emptying cyst it was found to spring from right kidney, which was then extirpated. Gradual increase of urine secreted up to 30 ounces daily, with perfect recovery and subsequent good health.

CASE 9. Female, æt. 59. Nephrotomy of right kidney, with removal of large calculus from its pelvis. Easy and rapid recovery.

These cases complete a series of forty operations on diseased kidneys performed by Mr. Tait. These cases have included abscesses, hydatids, sarcoma and calculi. Thirty-eight complete cures have resulted. With two exceptions, all of the operations have involved the right kidney. The most important lesson to be gained from this experience the operator believes to be deducible from the third case of the present series, viz., to always open a kidney and ascertain its condition exactly before removing it. He condemns interfering with the large malignant tumors seen in children under 15. He does not think it matters much whether the organ be attacked by an abdominal or lumbar incision, as far as the immediate success of the operation

is concerned, but he strongly prefers the abdominal section if there is any likelihood of the kidney having to be removed, on account of the facility which then exists to ascertain the condition of the other kidney before proceeding with the operation. For simple nephrotomy the lumbar incision is the better.—*Birmingham Med. Rec.* 1885. September.

V. DEMONSTRATIONS OF EXTIRPATED KIDNEYS. CASE 1. By Baron HOROCH (Vienna). After a fall two years before, the patient, a woman *æt.* 40, noticed a tumor in the right side of the abdomen. It was at first size of fist, and sank over to the left on lying on that side. It became more movable and caused stomach troubles. She had to press hard in making water, first passing a clot and then fluid blood with temporary relief.

Examination showed a sharply defined tumor, size of a baby's head, in the half of the belly, and reaching to the left of the median line. Both ovaries could be felt through the vagina. Catheterization of the right ureter gave a very turbid yellow urine containing blood-clots and flocculent pus; slow flow, more rapid on pressing the tumor. Urine from the left ureter was perfectly clear and free from sediment, though containing a trace of albumen. Inflating the colon by effervescent powder gave further diagnostic help. The whole region in front of the tumor filled up and became tympanitic—the cæcum reaching back to the axillary line.

Operation by Prof. Albert; 25 cm. long incision down in front from the eleventh rib. After removal of the tumor two rents were found in the peritoneum. The wound healed with moderate suppuration. Patient discharged completely recovered in four weeks.

The tumor was a carcinomatous degenerated adenoma of the kidney with some healthy kidney tissue remaining in its upper part. Weight 1,300 grms. Before the operation the patient secreted 500 ccm. of urine daily, and a like quantity for some days after. By the thirteenth day it had increased to 1,300 ccm.; by the twenty-second to 2,900, and finally struck a regular average of 2,400 to 2,600.

CASE 2. By Dr. CLAUS (Elberfeld). Woman *æt.* 46. Healthy up to four years previously, when she first noticed a rolling in the belly, increased by deep inspiration and rapid movements. Belly grew larger, but for a considerable time there was no pain. A fluctuating tumor was felt in middle of abdomen. Urine all right. Uterus retroverted; only in front of this a pedicle could be felt. Diagnosis, monolocular ovarian tumor. Not operated until the tumor had reached the size of a nine months' pregnancy. Laparotomy. Cyst contained dark bloody material; found to connect with kidney, hence ligation of renal artery and vein and commencement of ureter. Button sutures to the abdominal wound. Course normal. Patient could leave the hospital in four weeks.

Prof. Ribbert found the tumor to be a fibroma with few cells but abundant fibers. It had developed between medullary and cortical substance of kidney, pushing the two apart. The cyst-wall was formed by the distended kidney capsule. In the discussion which followed König stated that, in two recent cases in young children, he

had extirpated the kidney through the belly. In one it was for myxosarcoma of kidney. The operation was easy and successful in both cases. Schönborn said that two years previously he had successfully removed an adenoma of kidney in a child. No recurrence at end of four months.—Rept. of Germ. Surg. Congress in *Centbl. f. Chirg.* 1885. No. 24.

VI. PARTIAL RESECTION OF THE BLADDER FOR A TUMOR. By Dr. SONNENBURG (Berlin). Regarding the merits of suprapubic and perineal cystotomy for removal of calculus, vesical tumors, etc., there is considerable difference of opinion. S. points out that there can be no question of the superiority of the suprapubic method in cases of tumor not simply of the vesical mucous membrane but in the bladder wall itself. Here a radical operation necessitates resection of the bladder wall. Znamensky has demonstrated the possibility of such an operation by experiments on animals. S. thus operated in such a case with exhausting hæmorrhages, in a woman of 60. Petersen's balloon in the rectum. It proved necessary to remove two-thirds of the bladder. Peritoneum was opened but closely sewed up. Drainage through urethra and abdominal wound. The bladder could not be sutured. No reaction. Death from exhaustion four weeks later. A new vesical space size of a small apple had been formed from the peritoneum—as shown by the autopsy.—Report of Germ. Surg. Congress in *Centbl. f. Chirg.* 1885. No. 24. W. BROWNING (Brooklyn).

## Wounds, Injuries, Accidents.

I. ON TRANSPLANTATION OF LARGE SKIN FLAPS TO FRESH WOUNDS. By Prof. ESMARCH (Kiel). After reviewing past experience with this method and noting its success, especially in plastic operations about the eyes, he gives some cases of his own. Six years ago he thus cured an ectropium, and more recently the following:

CASE 1. A lady had suffered ten years from a rodent cancer of the nose, and been twice treated by curette and thermocautery. He cut out the diseased portion and, to avoid the disfiguration of a flap from the forehead, took a myrtle leaf-shaped piece of skin  $1\frac{1}{2} \times 3$  cm. from the left arm. The latter wound was sutured and healed by primary. The flap shrunk greatly on removal. It was fixed to the nose with four fine catgut sutures so as to fit without tension at any point. Sublimated lint dressing for ten days, when it was found everywhere united. It was somewhat paler and sallower than the reddened surrounding skin. In the following months a thick, horny epidermis layer formed, which had to be repeatedly softened up with warm water. At the end of four months its color was not so very different from the skin about it.

CASE 2. One of those hideous, pigmented mother-marks so frequent about the external canthus of the eye. Formerly he covered the defect on extirpation by pedunculated flaps from the neighboring temporal and buccal skin—in one case by allowing the wound to granulate and practicing Reverdin. In the present case he succeeded much better, by taking a lancet-shaped flap from each arm. Primary union in three weeks—the first dressing remaining two weeks. Pigmented portions of the eyelids he proposes to operate later.

CASE 3. The wheel of a heavy wagon had passed over this patient's face, causing

gangrenous sloughing of the nasal bone and much of the skin of the nose and vicinity. This was replaced by a large pedunculated frontal flap and the frontal defect in turn by two arm flaps. Primary union of all these.

He trims the flap to be transplanted free of all soft and yellowish tissue, until their inner surface is smooth, white and pliable as a glove. This is rewashed in sublimate solution before fixation. (Compare as to technique the abstract of Maas' article in *Annals* for June.)

E. has repeatedly taken flaps from amputated limbs, and once from an old (operated) hernia sac.

Langenbeck, of Wiesbaden, stated that as a rule he found the epithelial covering of the implanted flap came off in three to four weeks, when the flap became covered with granulations.—Report of Germ. Surg. Cong. in *Centbl. f. Chirg.* 1885. No. 24.

II. CASES OF TENDON-SUTURE. By Dr. von FILLENBAUM (Vienna). Although this subject was exhaustively treated by Wölfler last year, F. gives five recent army cases to show the value of W.'s method of suture.

CASE 1. Oblique cut across the back of the hand with a bread knife, involving the common extensor of the index and middle fingers and the extensor indicis. The central end of the latter retracted so far that it could not be reached, unless by slitting up its sheath. The tendons of the common extensor were each united by two fine silk sutures. The accessible peripheral end of the separate indicator tendon was attached beneath to both ends of the sutured indicator branch of the extensor communis. The strongly stretched extensor tendons of the second and third fingers were now fixed (to prevent retraction by muscular action) by silk sutures being passed 2 cm. higher up, through skin and tendon-sheath, and tied over a roll of iodoform gauze. The latter sutures were removed on the fifth day and skin sutures on the tenth. Passive motion was begun on the sixteenth. At writing, six months later, the man had perfect use of his fingers.

CASE 2. Razor cut on back of left thumb. Operated six weeks after injury. The thumb was found strongly adducted and bent into the palm. Active extension impossible; passive motion free. There was a 2-cm. long skin cicatrix and also a serous fistula. Operated under constriction. The tendon-ends but a few mm. apart and closely adherent to the sheath, were trimmed with scissors and united à la Wölfler; 2 mm. above the central end on the radial side a fine silk suture was passed outwards and again in towards the palm, through the whole thickness of the tendon, then back through and again palmar, and out at the ulnar side. After closely coaptating the two tendon-ends, the silk was passed through the peripheral end in a reverse order and finally the two suture ends were tied on the radial side of the tendon. Fixation-suture to the tendon and over-extension as in previous case. Further course without interruption. Four months later the thumb had normal motility, only at the place of former fixation-suture, the skin and tendon-sheath were adherent, as shown by the folding in of the skin on extension.

CASE 3. Tendon of left extensor digiti minimi severed. Its central end was only found after slitting up the sheath  $2\frac{1}{2}$  cm. Result excellent.

CASE 4. Extensor of left middle finger severed close to head of ii phalanx and adjacent joint opened. The articular capsule was first closed, then the tendon was sutured as well as possible, much difficulty arising from the thinness of the middle crus of extensor at this point. The wound united well. Finger was at first straight, though the end phalanx was but slightly movable. The finger gradually became more and more flexed and worse than useless. A further operation refused.

CASE 5. Perfect result from suturing the severed flexor of left thumb.—*Wien. Med. Woch.* 1885. Nos. 29 and 30. W. BROWNING (Brooklyn).

## Tumors.

I. BRANCHIAL CYSTIS. By Dr. H. D. CHAIN (New York). Two cases. CASE 1. An infant æt. 5 days, born with cystic tumor on right side of neck. Had rapidly increased in size and is now as large as an orange. Three silk sutures introduced and retained for three weeks. Reaction slight. Cyst then incised and its contents evacuated, sac distended with sol. acid carbolic (1 to 100) and dressed antiseptically. Sac did not refill, but gradually shrank down to a lump of connective tissue.

CASE 2. Boy æt. 8. Cyst size of hen's egg under right side of lower jaw and extending to upper part of neck. History of only two months. Seton introduced. Active inflammatory reaction necessitated its removal after three days. Cyst obliterated.—*The Med. Record.* 1885. July 25.

II. TRAUMATIC ANEURYSM OF THE SUBSCAPULAR ARTERY. By Dr. T. A. McGRAW (Detroit). An account of a case with reflections upon the best method of operative attack on such cases. The author's case was a male æt. 27, the subject of a pulsating tumor which filled up the whole axilla, the gradually developing sequel to a stab wound of the shoulder three years before. Diagnosed as an aneurysm of the axillary artery. Operated by exposure and attempted isolation of the sac, with the view of ligaturing artery outside of sac. In the course of the operation the sac ruptured. Sac then incised, clots turned out, orifice of vessel of supply easily detected but ligation of the vessel through the wall of the sac found to be impossible. The sac was then dissected out until it was possible to throw a ligature around its base. After cutting away the sac it was seen that it was an enlarged branch of the axillary that constituted its vessel of supply, the orifice of the sac being more than a quarter of an inch from the axillary. The axillary was tied on both sides of this branch. Patient did not rally after the operation and died at end of thirty hours. Post-mortem showed that it was the subscapular artery that had been the subject of the aneurysm. In conclusion, the author offers the following propositions:

1. The dangers and difficulties incurred in operating upon traumatic aneurysms by the so-called Syme's method are due principally to the obstruction made by the sac itself, which obscures the anatomical relations, hinders manipulations, and often offers an impassable barrier to the surgeon who seeks to tie the artery through its walls.

2. These obstacles may be overcome by the systematic dissection of the sac from

the surrounding structures, and the ligation of the artery from without instead of from within the sac.

3. This same method of treatment may be made available with idiopathic aneurysms whenever from any cause it may be necessary to operate upon them at the seat of disease.—*N. Y. Med. Journ.* 1885. May 22.

III. CASE OF INGUINAL ANEURYSM; LIGATURE OF EXTERNAL ILIAC; SUPPURATION OF SAC; RECOVERY. By Mr. W. J. WALSHAM (London). A man suffering from aneurysm, size of small cocoa nut, in right groin. Had syphilis. Aneurysm of two months' standing; 5½ inches in longitudinal diameter; 7 in transverse, and projecting two inches above level of thigh attributed to fall. The external iliac was exposed, and two kangaroo-tail tendon ligatures were applied  $\frac{3}{8}$  of an inch apart, and the vessel was divided between them with a scissors. The ligatures were cut short, a drainage tube inserted and the wound closed with catgut. The aneurysm remained soft and did not diminish in size. Twenty-three days afterwards the aneurysm gave way at one point and a day later the aperture had increased to the size of a penny-piece, and a clot the size of a walnut was projecting. A probe soaked in a strong solution of perchloride of iron was thrust into the sac through the clot in six or seven places, and the clot covered with collodionised lint. In two days the aneurysm was sloughing and a poultice was applied. Free suppuration ensued, the wound granulated, and the patient was discharged, well, in six weeks. This appears to be the first case in which this method of ligature has been applied to the external iliac. The advantages claimed are: First, that it diminishes the risk of secondary hæmorrhage by removing longitudinal tension of the vessel, and by ensuring that no part of the artery above the upper, and below the lower, ligature, is deprived of the nourishment it receives from the sheaths; and secondly, the artery being divided completely across, there can be no chance of its calibre being restored through the slipping of the knot, the too rapid absorption or giving way of the failure of division of the internal and middle coats.—*Med. Press and Cir.* 1885. April.

WILLIAM THOMSON (Dublin).

IV. CONTRIBUTIONS UPON THE FORMATION OF CANCER OUT OF CHRONIC INFLAMMATORY CONDITIONS OF THE CUTIS AND MUCOUS MEMBRANES. By Dr. CARL SCHUCHARDT (Halle). The author believes that with all our knowledge of the morphological anatomy and histological development, we have no appreciation of the essential nature or creative principle of malignant neoplasms and are not even able to distinguish carcinoma from certain inflammatory hyperplastic changes in epithelial tissue, nor sarcoma from recent granulation-vegetations, and that inquiries into the etiology of the subject are best adapted to throw light upon it. With this view, and holding Cohnheim's theories to be untenable, he advances his observations, first, however, pointing out that attention has been repeatedly called by various authors to the relation of neoplasms to inflammation, and holding it generally accepted by experienced surgeons that cancer may arise from continued or repeated irritation, as sarcoma may do from a single violent traumatism.

He publishes seventeen cases, four of which treat of the tongue or mouth appearing after ichthyosis had previously existed in the parts for years. In such changes the epithelial elements play a much greater part, in the opinion of the author, than was formerly believed. This can be shown by the help of the figuration of the nuclei, in accordance with recent morphological investigations, as well as by the presence of the substance known as eleidine (Ranvier); and the formation of cancer as well as the ichthyosis (psoriasis) lingue is due to a proliferation of the epithelium of the mucous membrane, sustained by a fluid supply through the blood-vessels of the underlying strata, since a metamorphosis of connective tissue-cells into epithelial ones cannot be conceded.

The other cases refer to cancers of the cutis, most of which occurred at the seat of such chronic irritative affections of the skin as are frequent in chimney sweepers and have since been observed by Volkmann in the workmen in tar and paraffine factories, and described by him as consisting in an additional formation of epidermis and an increased activity of the sebaceous glands. Microscopic examination of the skin affection reveals the epithelial layer developed to such an extent that only a slight increase would be necessary to stamp it as a malignant neoplasm.

Five cases finally represent facial cancers which had developed from the senile dry form of seborrhœa, appearing as small prominent yellow or brown fatty squamous deposits on the skin, that on removal reveal the bleeding cutis. The pathology and microscopical anatomy of this affection is minutely given.

Regarding the etiology of facial cancer, the author follows the opinion of Volkmann that it is due to insufficient cleanliness and care of the skin.

The treatment consists of prophylactic cleanliness and removal of skin affections; seborrhœa to be treated with alkaline lotions; psoriasis lingue, etc., with actual cautery; developed cancers to be extirpated.—Volkmann's *Samml. klin. Vorträge*. No. 257.

W. VAN ARSDALE (New York).

## Bones.

I. EXPERIMENTS UPON ENGRAFTED BONE. Dr. Ambrogio Ferrari, after a long series of experiments upon the phenomena attending the engrafting of bones, reaches the following conclusions:

1. Pieces of bone engrafted into the shaft of a long bone become completely united and continue to live.
2. They not only continue to live, but also grow.
3. That such results follow without reference to the position in which the engrafted bone is placed.
4. The reunion of grafts occurs by a true vascularization which takes place between the engrafted bone and that into which it is introduced.
5. That a bony callus, periosteum and medulla are formed in relation with the engrafted bone.
6. That, as in fracture, this callus possesses a temporary vitality.



7. That after a certain time this callus, periosteum and medulla are absorbed, and the engrafted bone is nourished only by a greater vascularization.

8. That grafting occurs more completely if the inserted bone is in exact adaptation with the margins of the bone receiving it. While this observation is not verified, in a case where the opposite condition existed, a longer time was necessary for union to take place.

9. The most complete and careful antisepsis is required in order that complete union of the engrafted bones may occur.

10. The engrafting of several pieces of bone succeeds completely.

11. That in case of engrafting of several pieces of bone with partial suppuration, union of some of the pieces may take place, provided suppuration does not extend to that portion of the engrafted bone in communication with the medulla.

12. Besides antiseptic precautions, compression is required to maintain contact between the medulla and the pieces of bone engrafted in order to obtain a successful result.—*Gazetta degli Ospitali*. 1885. July 22.

## Gynæcological.

I. ON THE ORIGIN AND CURE OF A COLO-UTERO-VAGINAL FISTULA. By Dr. A. BIDDER (Berlin). B. marks three chief periods in the history of his case: 1. Origin of an anus præternaturalis colo-utero-vaginalis. 2. Transformation of the same into an intestinal fistula. 3. Operative closure of the fistula and removal of the remaining intestinal stenosis.

A woman æt. 22 had her first confinement in 1878. Three weeks later a left-sided parametritis resp. pelvi-peritonitis was diagnosed. Some months later a tumor was made out in the uterus. The cervix was dilated and a soft tumor extirpated, which proved to be a 20 cm. long portion of the sigmoid flexure. There had been no symptom pointing to rupture of the uterus and invagination of intestine. Flatus and feces soon passed by the uterus and a left sided phlegmon of the recto-vaginal septum developed, with necrosis of the left vaginal wall, etc.

At the juncture of uterus and left vaginal arch a hole formed, through which the finger passed directly into the descending colon. A valve-like fold of the gut-wall turned all the feces into the vagina. Up to 1883 the various attempts at remedying the trouble proved futile.

B. first saw the patient in 1883 and operated that fall. To gain free access a retractor was applied to the left vaginal wall and the vaginal portion divided to the right. The front lip was drawn down and forwards, the other down and backwards. Two to three cm. of the gut-wall was then prepared off from the uterus, the lip-shaped adhesion divided and vaginal and intestinal walls separated to a depth of 1½ cm. The gut, freed all around, was folded into its lumen, whereby the upper edge covered the lower somewhat like a valve (dédoublement). The depth of the wound prevented the application of sunk sutures to the gut; however, the vaginal and uterine walls were brought exactly together with five deep sutures. Salicylic acid to the wound and a tampon of iodoform gauze. On removing the remaining sutures five weeks

later, the cicatrization was found complete. Not a trace of fecal matter had entered the vagina since the operation.

For the very reason that the unnatural path had been closed by the operation an intestinal stenosis now made itself evident. A broad sack-like transverse fold formed, with its base at the left pelvic wall and its edge near the uterus. Under guidance of the finger in the rectum he pushed a curved trocar through the base, drew a rubber cord after it and over the free edge of the duplicature and tied it. By the next day it had cut through. A severe pararectal inflammation followed, on abatement of which the stenosis was gone and the fecal passage free. Everything remained well until January, 1885, when, without any known cause, a fresh subacute inflammation of the pararectal tissue set in. From this she is now convalescent.

A fully analogous case was not found in the literature,—Rept. of Germ. Surg. Congress in *Centbl. f. Chirg.* 1885. No. 24. W. BROWNING (Brooklyn).

II. CASE OF LAPARO-MYOTOMY. By Dr. ALEX. J. MCCATTY (Jamaica, W. I.). Female, æt. 35. Single. Great and increasing dysmenorrhœa. Constant pelvic pain. Progressive emaciation and loss of strength. Movable tumor size of foetal head in hypogastrium. Laparotomy, May 29, 1884. Listerian precautions observed. Incision from umbilicus to pubis. Tumor found to spring from fundus uteri by a broad pedicle, 4 inches wide, which embraced both Fallopian tubes. Right ovary contained a cyst about size of a goose-egg. Pedicle secured by clamp, and tumor excised together with both ovaries. Actual cautery to stump, which was then returned into abdominal cavity. Wound in abdominal wall closed by silver and silk sutures. Patient made a good and prompt recovery, and was discharged well June 21 ensuing. The tumor was a myoma and weighed 3½ pounds.—*Original Communication.*

## REVIEWS OF BOOKS.

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I. TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION. Volume II. Edited by J. EWING MEARS, M.D., Recorder of the Association. Philadelphia. 1885.

II. TRANSACTIONS OF THE NEW YORK STATE MEDICAL ASSOCIATION FOR THE YEAR 1884. Volume I. Edited for the Association by AUSTIN FLINT, JR., M.D. New York. 1885.

I. This volume contains the papers read before the American Surgical Association, at its meeting held in Washington from April 30 to May 3, 1884. The first of these papers is the contribution of Prof. S. D. Gross on Wounds of the Intestines, a paper which has already been noticed in the *Annus Chirurgicus* of the January number of the ANNALS OF SURGERY. The contributions of Professor Briggs on the Surgical Treatment of Epilepsy, of Professor Gunn on Manipulation in the Reduction of Hip and Shoulder Dislocations, and of Dr. Senn on Experimental Researches in Cicatrization of Blood-vessels after Ligation, have also already received due mention in this journal. These, however, though among the most important papers, form only a small fraction of the whole number of valuable contributions that compose this volume. If the increase in the number and quality of the contributions offered at its meetings is an index of the progress of a society, the American Surgical Association may be congratulated upon the indication which this present volume gives of its growth. Immediately following the contribution of Prof. S. D. Gross are two papers which deal with some phases of the question of anæsthesia. The first is by Dr. B. A. Watson, of Jersey City, and is entitled, "An Experimental Study of Anæsthetics." The aim of the author is to show, by experiments on rabbits and dogs, the physiological action and relative safety of chloroform, ether, bromide of ethyl and various mixtures of these drugs. His conclusions are that sulphuric ether is decidedly the safest anæsthetic yet employed in general surgical practice: that a mixture of alcohol, chloroform and ether is radically wrong, and practically bad, since it is much more dangerous than ether. As for bromide of ethyl, he strongly asserts that neither alone nor in mixture should this drug ever be employed for producing anæsthesia, especially where it is necessary to prolong the state.

The second paper is by Dr. D. W. Cheever, of Boston, and is en-

titled: "Some of the Dangers and Disadvantages of Anæsthesia." It is limited to a concise statement of the well-known possible dangers and troubles that often complicate attempts at inducing anæsthesia by ether. It contains no new suggestions.

Next follow a series of six papers upon different points in the surgery of the skull or brain. Dr. P. S. Conner, of Cincinnati, reports two cases of traumatic cephal-hydrocele, with a tabulated resumé of cases collected from medical literature. Drs. Fenger and Lee, of Chicago, report a case in which a cerebral abscess, following a penetrating pistol shot wound of the skull, was successfully treated by trephining, exploratory puncture and drainage. They accompany the report with a systematic discussion of points involved in such cases.

Dr. Nancrede, of Philadelphia, also reports a case of cerebral abscess following a penetrating wound of the skull over the left middle parietal lobe, by a knife blade, which, being broken off, was left for a time *in situ* before it was extracted. Symptoms of brain pressure having become threatening, trephining was done, an aspirator needle plunged into the brain in the direction of the supposed abscess, at first fruitlessly, but after a few moments with the escape, through the puncture left by the withdrawal of the needle, of a drop of pus. A free-incision then resulted in the evacuation of from one to two ounces of pus. Patient was then already apparently dead, but was resuscitated after prolonged efforts and lived for four days. Post-mortem showed greater part of the upper portion of left hemisphere destroyed by the abscess. In the discussion which followed other interesting cases of brain abscess were reported.

Genito-urinary surgery is represented by three short papers.

Two of the most interesting contributions in the volume deal with railroad injuries. One by Dr. Thompson, of Paducah, is limited to injuries of the hand; the second, by Dr. McCann, of Pittsburg, includes all the extremities. This is a field of observation in which the vast extent of the railway systems of the United States affords unusual opportunities for surgical improvement. The American Surgical Association could do no better thing than to organize a system by which the experience of American railway surgeons could be gathered, digested and published.

It is impracticable to mention separately all the contributions which are contained in this volume. They number twenty-six in all, from as many different Fellows, who represent every part of the United States, except the Pacific Coast. This volume makes a book of over 500 pages. It is graced by an excellent photo-type of the lamented Professor S. D. Gross, to whose efforts the Association owes its birth, and

whose latest contribution to surgical literature forms the first paper in the volume.

II. This volume contains the record of the work of the New York Medical Association at its first session after its organization, held in New York City in November, 1884. It is a large and handsome octavo, of 654 pages, including an index. It is edited by Dr. Austin Flint, Jr., and shows the signs of the oversight of a practiced book-maker, in the fulness of all the details required to make such a book perfect. A considerable proportion of the contributions are of a surgical nature, mostly quite brief, the greater number being reports of cases, with reflections suggested by the same. More elaborate are two papers on Transfusion, one by Dr. E. M. Moore, of Rochester, and one by Dr. J. C. Hutchison, of Brooklyn. The chief idea of the first writer is to show the importance of reducing to a minimum the time required for the complete operation of drawing from the vein of the donor the blood, and injecting it into the vein of the recipient. He concludes that fresh blood in but small quantity should be used, and for facilitating the operation he describes a new apparatus. In the second paper a review of recent literature of the subject of transfusion is given, the writer accepting the conclusions that the important element in transfusion is the restoration of fluid to the vascular system, increasing vascular tension and causing energetic contractions of the heart; and that intra-venous injection of saline solutions in appropriate cases is a more simple and is a safer operation than transfusion of blood, so that, if further experience should confirm the favorable results of such injections, the operation should be held in high esteem as an important therapeutic agent. The writer gives also a description of an apparatus for the ready administration of these injections. Two papers of a statistical nature, one on Double Synchronous Amputations, by Dr. Lynde, of Buffalo, and one on Dislocation of the Hip, based upon 223 cases occurring in New York State, deserve mention. Lastly a paper by Dr. Dennis, of New York City, on the Relations between Tuberculous Joint Diseases and General Tuberculosis, should be noted. This volume of Transactions indicates an unusual activity and earnestness on the part of the members of the Society, which awakens an expectation of much future valuable work. L. S. PILCHER.

UNTERSUCHUNG DER WEIBLICHEN GENITALIEN UND ALLGEMEINE GYNÄKOLOGISCHE THERAPIE. Von Dr. R. CHROBAK, Professor an der Universität Wien. mit 104 Holzschnitten. Stuttgart: Verlag von Ferdinand Enke. 1885. Pp. VIII-278.

This volume, No. 54 of Billroth and Luecke's "Deutsche Chirurgie."

is from the pen of a writer whose name always carries with it the assurance of careful, conscientious work. Dr. Chrobak has already written so exhaustively upon this same theme in the "Handbuch der Frauenkrankheiten" that a second monograph would seem to be superfluous. A peculiar feature of modern medical literature is the prevalence of cyclopædias. The department of gynecology has been particularly favored in this respect. Although there can be no question as to the value of a series of monographs on this subject by authors of world-wide reputation, it is of no special benefit (to the reader) to add to the number of existing cyclopædias which do not present essential points of difference. However, we should not seek for the *raison d'être* of a book which presents so many excellent features as the one under consideration.

A comparison of the table of contents of this volume and the corresponding one of the "Handbuch," will show that the arrangement of the two books is almost identical: the difference is really only such as would naturally result from the progress of gynecology during the past six years.

The bibliography at the beginning of this volume is unusually exhaustive and is most carefully arranged. Part I., including the first 126 pages, is devoted to examination of the pelvic organs. The order followed by the author is the usual one.

A brief introductory chapter on symptomatology and anamnesis, which is too condensed to be of much value, is followed by some general instructions regarding the manner of conducting the examination. Chapter III. contains a description of the different positions, with the advantages of each. It is rather amusing to note that the author, after referring to the large number of examining tables which have been devised, selects as a representative one a most unsightly object, which would certainly never be tolerated in any American clinic or private office (Fig. 3). The chapters on inspection, palpation and percussion of the abdomen furnish some useful hints, especially regarding the differential diagnosis of tumors of pelvic origin. Pages 30 to 45 contain the clear and excellent description of the method of vaginal and bimanual examination which is found in the author's former treatise. A few changes have been made, and there is a useful addition regarding the examination of the hymen, but the reader will regret to see that Fig. 5 has been preserved as an ideal illustration, since it is both misleading and most displeasing to the eye.

It is a common fault of manuals of gynecology that they are disposed to lay too little stress upon the frequent difficulties which are encountered in "mapping out" the pelvic organs by the bimanual touch.

It should at least be stated that the distance between the fundus uteri and the surface of the abdomen is quite as often two or three inches as it is one-half inch. A clear understanding of this fact will save the student from many disappointments.

The chapter on the use of the sound remains practically as before, neither will the reader see any improvement in chapter XI., on the "Ocular Inspection of the Genitals."

Chapter XII. treats of the "Dilatation of the Genital Canal," and covers the subject pretty thoroughly. Several pages are devoted to the use of tents; indeed, the author has treated this important topic in a most satisfactory manner. It is to be regretted that he has not been equally exhaustive in his description of the method of instrumental dilatation of the cervix, a procedure so common in this country.

Incision of the cervix is discussed at length, the writer not being very enthusiastic regarding the value of this operation for the cure of sterility and dysmenorrhœa. He favors it rather as an aid to more accurate diagnosis in cases of intra-uterine growths. Most of the instruments ordinarily employed are figured (Fig. 39 to Fig. 42, inclusive). Due stress is laid upon the contra-indications, to complications and frequent failure of the operation.

It is rather surprising that the author should still adhere to the old-fashioned method of introducing a styptic tampon into the cervical canal after the operation, when the glass or hard rubber plug is so much cleaner. The cruciform incision of Fritsch, and the plastic methods of Chrobak and Küster are mentioned (pp. 116-117). The description of Schröder's method of "Keil-excision," or removal of a wedge shaped mass from the cervix, would have been rendered much more intelligible by the introduction of one or more drawings.

Chapter XIII. is entitled "Artificial Dislocation of the Uterus," under which ponderous heading the simple process of grasping one lip of the cervix and drawing the organ downwards is described. It will be readily inferred that "artificial prolapse" of the uterus is not usually such a violent proceeding with us as with our German confères. On page 123 the author figures a complicated apparatus which he has designed for the purpose of exerting a steady and prolonged traction upon old peri-uterine adhesions. It is stated quite confidently that after the claws of this instrument have been attached to the cervix for eight or ten hours (!) "even very firm cicatricial bands are rendered pliant and extensible." No reference is made to the possible consequences which may result from this severely mechanical method of rendering a uterus more movable. The concluding chapter of Part I on diagnosis is short, but exceedingly pithy. We commend it, not only

to beginners but to the experienced. "On the whole," he says in conclusion, "inexpert physicians will make the more positive and often the more uncommon diagnosis. The more experience we have, the less our belief in medical infallibility, the more frequently do we make probable diagnoses and the more rare are so-called 'beautiful' cases."

Part II is introduced by a long preliminary chapter on the principles of uterine therapeutics, including the indications for operations and the best time for performing them. Then follow a short section on anæsthetics and a long one on antiseptics, the latter being new and worthy of careful perusal. There is nothing of particular interest in the chapter on vaginal injections. The usual object aimed at is simply cleanliness, the author explains, although he adds parenthetically that hot water injections have been recommended by several writers for the relief of pelvic inflammation. We have never met with such unpleasant phenomena as Dr. Chrobak describes as often resulting from the use of the vaginal douche. As regards intra-uterine medication it is unnecessary to express disapproval of the syringe as an adjuvant, at least when the cervix is not dilated. The description of the method of applying caustics to the uterine mucous membrane will also be of little interest to American readers, who believe that the same results can be obtained by more merciful treatment. Several pages are devoted to the use of the actual cautery in malignant disease, for the arrest of hæmorrhage, etc.

The chapter on pessaries possesses the common fault of all similar chapters in manuals of gynecology—it is unnecessarily long and describes and figures a number of modifications which simply confuse the general reader and weary the specialist. It is to be hoped that the time will come when the instrument of Zwanck (Fig. 80, page 242) will no longer find a place in even a German treatise. The same might be said with regard to some of the intra-uterine stems figured in this chapter (pages 254 to 257). It should be stated in justice to the author that he does not seem to approve very warmly of the use of these relics of a past civilization.

Short chapters on abdominal bandages, uterine massage and hypodermic medication conclude this volume, which, while it contains much that is useful and instructive, will hardly supplant the similar monographs that are already in the field.

H. C. COE.



# PAPILLOMATOUS CYSTIC DISEASE OF THE BROAD LIGAMENTS; ITS CLINICAL AND OPERAT- IVE FEATURES. WITH THREE CASES.

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IN the domain of practical surgery papillomatous cystic disease of the broad ligaments is scarcely yet recognized as having a separate existence. In no practical work with which I am acquainted is any attempt made to classify it as a distinct disease; in most it is not even mentioned. Coblenz,<sup>1</sup> of Halle, in several monographs has minutely discussed the pathology of these cases, and has provided clinical examples. Alban Doran in his excellent work on Tumors of the Ovary, Fallopian Tube and Broad Ligament, has made further and elaborate contributions to our knowledge of this disease, and by short descriptions of at least nine cases, met with at the Samaritan Hospital, has materially added to our knowledge of its clinical features. With the exception of a few scattered cases in books and journals, quoted mostly as examples of difficult operations, this represents the sum total of the literature of the subject.

That the disease deserves the closest possible scrutiny is certain on several grounds. Its removal is among the most difficult of the many difficult operations in abdominal surgery, and it ought, if possible, to be attacked with the full foreknowledge that is expected of a man who would perform a hysterectomy or resect a piece of intestine. Its existence also

<sup>1</sup> Coblenz's papers are to be found in Virchow's Archiv., Band. LXXXII and Band. LXXXIV, Zeitschrift für Geburtshilfe und Gynäkologie, Bd.VII, Heft. 1, and Archiv. für Gynäkologie, Bd. XVIII, Heft. 2. An admirable summary of these papers is to be found in the London Medical Record of March 15, 1882.

is attended with more risk to the patient than ordinary cystoma of the ovary; a papillomatous growth is peculiarly liable to rupture, and, possibly as a result of this tendency, to cause general infection of the peritoneum. It is right, therefore, that every possible means of contributing to the diagnosis and practical management of these cases should be placed in the hands of the profession, and I offer my experience and the lessons it has taught me, in the hope of furthering this object.

*CASE I. Papillomatous disease of right broad ligament intimately attached to much enlarged uterus; enucleation; posterior surface and fundus of uterus denuded of peritoneum; free hæmorrhage; use of actual cautery; recovery.* Mrs. R., æt. 32, suffering from an abdominal tumor, was sent to me in March, 1882, by Dr. Challacombe, of Bristol. She had been twice married, but had never been pregnant. A year previously, six months after her second marriage, she noticed that her abdomen began to swell, and in spite of irregular and occasionally profuse menstruation, supposed that she was pregnant, and made preparations accordingly. When the period of gestation seemed to have passed she consulted her medical man, who diagnosed ovarian tumor and sent her to me.

Her symptoms she considered to be those of pregnancy. They were increased frequency of menstruation, troublesome constipation, occasional attacks of sickness, and on one occasion, at least, a sharp illness, with abdominal pains and frequent vomiting, which lasted for two days and confined her to bed for a week. No medical man was called in. On two other occasions she had less severe attacks of the same nature, but considered them all as ailments of pregnancy. At these periods she was not conscious that the swelling decreased in size, but they were always immediately followed by flatulent distension. Uterine hæmorrhage came on at uncertain intervals from a fortnight to two months, was sometimes scanty and sometimes profuse, and lasted from one to ten days at a time. She had lost flesh.

Her condition on examination was as follows: The whole of the right side of the abdomen was occupied by a soft, boggy, obscurely fluctuating growth. On the left side of the lower abdomen, extending as high as the umbilicus, and separated from the growth on the right side by a deep sulcus, visible through the parietes, was an irregular cystic growth in which fluctuation was obscurely perceptible. In the sulcus between these cysts a firm resisting body could be palpated, which, with the help of the sound, was made out to be the enlarged uterus. The growth was absolutely immovable. Per vaginam a soft.

fluctuating cyst which could not be disturbed from its position was felt in Douglas's pouch. The uterus was high up just within reach of the forefinger, and admitted the sound to the extent of four inches. It could not be moved in any direction.

The operation was performed in private, Mr. Haisant administering ether and Mr. Bush assisting, and Drs. Challacombe and Yyffe being present. On entering the abdominal cavity the enlarged uterus appeared lying between the cystic growths and apparently intimately incorporated with them. The large cyst on the right side was tapped; milky fluid flowed freely till the growth was diminished in size about one-half and then suddenly stopped. The trocar being removed, the opening was drawn to the surface and enlarged so as to admit the hand to break up what were supposed to be secondary cysts. A handful of papillomatous material was removed and was followed by so profuse bleeding that sponges were packed into the cyst and the growths on the left side were attacked. From one cyst clear watery fluid was removed, from another almost pure blood very dark in color. The cyst in Douglas's pouch was beyond the reach of the trocar and was burst during manipulation. It was now evident that the growth was incorporated in the right broad ligament and was intimately attached to the whole of the posterior surface and the fundus of the uterus. The incision was enlarged upwards to the umbilicus and downwards as far as possible, and after the separation and ligature of a few adhesions to omentum and bowel and the diminution of the main cyst by removing blood clot and sponges, the whole was turned out and laid on the macintosh over the pubes and thighs. After a tedious process of dissection in which the actual cautery had frequently to be used on account of free bleeding from the uterine tissue, the growth was enucleated. The uterus was left without peritoneal covering anywhere on the posterior surface or fundus and only fragments of the right broad ligament remained. As the enlarged uterus lay over the pubes, all bleeding from its tissue was finally checked by ligature or cautery. The peritoneum in Douglas's pouch following the uterus was close to the abdominal wound, and having been somewhat roughly handled, was closely examined to make certain that the rectum had not been torn. The right ureter was denuded and plainly visible. The left ovary showed incipient cystic disease and was removed. When all bleeding had been checked the abdominal cavity was sponged out, the uterus was returned to its place and the wound closed. Unwisely, perhaps, I did not insert a drainage tube. The operation lasted an hour and a quarter,

The patient, though seriously collapsed for a few hours after the op-

cration, made an excellent recovery under the care (in my absence) of Mr. Haisant. I believe that a considerable hæmatoma formed in the pelvis, which was the cause, three weeks later, of a considerable rise of temperature ( $104^{\circ}$ ), which, however, soon subsided. Metrostaxis came on immediately after operation and lasted for three days. Up to date the patient has continued in excellent health and has not menstruated.

*CASE II. Papillomatous Disease of Left Broad Ligament. Reliable history of rupture on at least twelve occasions. Enucleation of growth with denudation of fundus and part of body of uterus; free bleeding; actual cautery applied to uterine tissue. Recovery.* Mrs. P., æt. 40, the mother of four children, was sent to me by Mr. Newstead, of Clifton, in September, 1884. She had an abdominal growth which had been very slowly increasing in size during four years. The most striking feature in the history was that about four times every year it had been the cause of serious illness, apparently from the rupture of a cyst. At the onset of the acute illness the abdomen suddenly decreased in size and became less tense. In the intervals it slowly increased for about three months, when rupture took place. During these intervals the only discomfort she experienced, apart from its bulk, was increased frequency of micturition and constipation, necessitating the frequent use of purgatives; at the period of supposed rupture she went through an illness which was always serious and sometimes alarming. Mr. Newstead had seen her in three of those attacks; and, in consultation with him, I saw her in a fourth. I had seen her just before the period of expected rupture and took measurements and made drawings of the sites of the main protuberances. The abdomen was distended from flatulence, so that measurements were useless, the superficial aspect of the enlargements was, however, much changed. One prominent cyst had completely disappeared and the others were apparently not so tense. She presented the ordinary symptoms of acute peritonitis, with small, rapid pulse, constant retching and vomiting, some rise of temperature and great prostration. The patient was so seriously ill that I thought the best chances of recovery would be got from immediate operation, and it was only Mr. Newstead's assurance that he had seen her through as grave attacks before, that prevented my urging active interference. It was decided to postpone operation till she had reached her best period, which was usually about a month after these attacks.

The growth was a very irregular one, and occupied chiefly the left side of the abdomen. On the left side, reaching to just below the ribs, was one smooth, soft-walled and not very tense cyst. On the right side, and springing out of the pelvis, were several small fluctuating pro-

tuberances, apparently the loculi of a polycystic growth. Between the two and lying in a shallow groove lay the greatly enlarged uterus, into which the sound readily entered for four and a half inches. Vaginal examination revealed several small tense cysts in the retro-uterine cul-de-sac. The os uteri was drawn up and the whole organ was absolutely fixed, as was the tumor generally.

The operation was performed in private on October 9, 1884, with the assistance of Mr. Bush and Mr. Haisant, who administered ether. The proceeding was very similar to the previous one. The enlarged uterus presented at the wound, and the growths were closely attached to its left side, fundus, and some way down the anterior and posterior surfaces. A trocar was inserted into the large cyst, but very little fluid came away. A cyst containing about a pint of clear bloody fluid and lying behind the uterus was evacuated and lessened the immobility of the whole. The hand was carried into Douglas' pouch and after separation of a few adhesions, the cysts which lay there were coaxed to the edge of the abdominal opening and freely incised. By this means much additional space was afforded for the enucleation of the large growth, which was now proceeded with. A sound was inserted into the uterus as a guide; for so closely was it incorporated with the growth that it was impossible to say where the tumor ceased and the uterus began. The growth was at first separated by dissection from the anterior surface of the fundus, and then for some way down the posterior surface and the left side. The bleeding was free, and as the dissection was getting deeper became more difficult to control. I therefore enlarged the incision and tried to deliver the main cyst. In doing this, its wall ruptured and a good deal of rosy and papillomatous material escaped into the peritoneal cavity. When the growth was delivered its separation from the posterior surface and side of the uterus was completed. After the last cut blood welled freely from the uterus at the site of the uterine artery. After failure with the actual cautery this was checked by ligature. So closely was the growth adherent to the side of the uterus that I found I had removed with the tumor a strip of muscular tissue an inch broad and three inches in length. Practically no broad ligament was left behind. As oozing from the denuded uterine surface continued after the growth was removed, the actual cautery was somewhat freely applied. The right ovary appeared to be healthy and was left behind. The cavity was thoroughly cleansed, a glass drainage tube was inserted and the wound closed. The operation lasted an hour.

The patient was gravely ill for a week, with constant vomiting, very rapid pulse and great restlessness. There was considerable discharge

of pure blood from the tube for four days, and of bloody serum for three days more, at the end of which time it was removed. Free metrorrhagia came on at the end of a week with immediate amelioration of symptoms. For the first week she was fed entirely on nutrient peptonized enemata, large hot water injections being given to relieve thirst, once or twice daily. For flatulence she wore the rectum tube for hours at a time, and derived great benefit from its use. She rapidly convalesced and has continued in excellent health, menstruating regularly and without pain.

CASE III. *Papillomatous Cystic Disease of Right Broad Ligament; suppuration in minor cysts; bladder much elevated and spread over tumor. Enucleation after denudation of part of uterine surface. Pyo-Salpinx on left side removed. Recovery.* Mrs. G., æt. 47, a widow without children, was sent in June, 1885, by Dr. Steele of Clifton, to the Bristol Infirmary. An abdominal tumor had appeared two years previously, in the right hypogastric region and had been slowly increasing since. In the last six months she had lost flesh a good deal. Her chief trouble arose from greatly increased frequency of micturition, amounting almost to incontinence. Several times there was retention and she had to get relief by catheterism. Constipation also had become a prominent symptom. She never got relief without the use of purgatives; frequently as many as four days passed without an evacuation, and on one occasion constipation was absolute for eight days. A curious feature, which had existed for some few months, was that she was unable to defæcate except in a nearly erect posture. She suffered a good deal of abdominal pain, chiefly from flatulence, but to some extent also in the tumor itself.

The lower and middle abdomen were occupied by what seemed to be two distinct tumors separated by a deep groove. Indeed, she was sent to the Infirmary as suffering from two ovarian growths. The larger growth, on the right side, was soft and boggy, but did not fluctuate and felt like a soft myoma. On the left side little more could be made out than that there was a nodulated growth there, on account of some undue thickness of the abdominal wall (found at operation to be thickened and adherent omentum) and the pressure of resonant coils of intestines overlying it. The os uteri could not be felt by the finger. The vagina was drawn up behind the pubes into a long narrow tube, the top of which, after repeated trials, could never be reached. The vagina was crowded forwards by lobulated cystic growths, which filled Douglas' pouch and pressed on the rectum. The growths here were

very tender to the touch and the examination caused considerable pain.

She went out and returned in six weeks suffering from what appeared to be a sharp attack of peritonitis. For a fortnight she was ill, with frequent vomiting, quick pulse, high evening temperatures and great abdominal pain, with flatulent distension. This greatly reduced her strength, and when I returned from a holiday to operate at once, her condition was not at all favorable for the performance of a grave operation. The main growth was now distinctly fluctuating.

The operation, performed in the operating room of the Bristol Infirmary, was a difficult and troublesome one. On making a two-inch incision in the ordinary situation, instead of entering the peritoneum, I came upon a soft, polypoid body, which bulged through the opening. A sound passed through the urethra showed this to be the bladder, completely empty but much drawn upwards. The incision was extended to the umbilicus and, when the peritoneum was divided, it was found to be adherent to dense, thick omentum so intimately that, instead of trying to separate it, it was deemed best to continue the incision through it. After the application of double ligatures this was done to the extent of the external wound. The bladder bulged into the opening, interfering with manipulation, so a flat sponge was packed in over it, which, somewhat ineffectually, kept it out of the way.

The uterus, greatly enlarged, lay under the opening, and the growth covered by the same peritoneum and apparently continuous with it on the right side, surrounded it. The whole was so firmly fixed that the cysts could not be rolled under the abdominal opening to be tapped. From the large cyst on the right side milky fluid flowed freely to the amount of about two pints and then stopped. The trocar was removed and the opening closed by large pressure forceps. The cysts on the left side were now attacked. From one flowed clear reddish fluid, from another pure pus, which some of the bystanders thought to be putrid. This decided me to try no more tapping at such a distance from the surface, so the opening was closed by forceps, a few sponges were packed into the pelvis, and the separation of the growth proceeded with.

A mass of thickened tissue, over which lay an enlarged Fallopian tube, which extended from the right cornu of the uterus over the growth, was surrounded by a ligature in the expectation of cutting off some of the blood supply. The growth was then rapidly cut away by scissors from the side of the uterus and from the bladder, forceps being applied at every step to check the free bleeding. The ligature at the cornu of the uterus appearing insecure, I transixed beyond it and tied the mass in a Staffordshire knot. In doing this it was felt that the

uterine cavity had been entered. When the prolonged dissection was completed the fan-shaped bladder lay partly free, partly over the uterus, and a raw surface as large as the palm of the hand belonging to the uterus, part of broad ligament and part of bladder was left. The minor cysts were now separated from numerous attachments in the pelvis—one suppurating cyst being ruptured in the manipulation—and the whole growth removed.

During these manipulations the uterus was curiously immovable. The cause of this was now found in a second cystic growth as large as a goose's egg, attached high up in the abdomen near the left kidney, and dragging with it the left broad ligament enormously thickened and enlarged. The fundus uteri, left to itself, reached as high as the umbilicus. This cyst, lying in a mass of dense inflammatory tissue, was enucleated and ruptured in doing so, its contents, pure pus, escaping into the abdominal cavity. When it was removed, a hard, uncollapsed cup of inflammatory material was felt, into which the finger tips could be inserted. This hollow and the whole of the abdominal cavity were carefully sponged out, a glass drainage tube was inserted and the wound closed. The operation lasted an hour and a quarter.

The patient was much collapsed for a few hours, but rallied and made an excellent recovery. There was no sickness nor trouble from flatulent distension, and her temperature, taken every four hours, continued normal throughout. Metrostaxis appeared at once and lasted, in considerable amount, for six days. The tube, from which a good deal of blood and bloody serum escaped, was removed on the fourth day.

These operations were performed with full Listerian details, ordinary gauze dressings being employed, which were removed at the end of a week, when the stitches were taken out.

The points of resemblance in these three cases as to clinical signs and symptoms, peculiarities of operative procedure and nature of growth removed, are too close to be merely casual. They belong to a class which is not uterine and which is not ovarian. They lie chiefly in the broad ligament and they contain cauliflower papillomatous growths. While not pretending to offer opinions as to their exact nature and pathological origin, for which the material at my disposal is insufficient, I have no hesitation in placing them in the class which Mr. Alban Doran describes as "Papillomatous Disease of the Broad Ligaments." Leaving the pathology in his competent hands, I shall here shortly sum up whatever clinical features



they seem to have in common. Such summary must necessarily be only a skeleton outline, for the rarity of the disease and the paucity of recorded cases afford scant material to work upon.

The leading characters of the growths removed will have been gathered from the descriptions of the operations. In all there was one large thick-walled main cyst, occupying one side of the abdomen, embedded in the broad ligament and sessile on the uterus. In all, also, there were several subsidiary cysts, most of them thin-walled, with thin clear or bloody fluid, some of them purulent, and in the third case two of them containing papillomatous growths. In no one was there the slightest vestige of a pedicle. In the first and second cases the large cysts were about half filled with papillomatous material, in the third case there was papillomatous growth in two small cysts as well as in the large one, but only in small amount, perhaps filling one-fourth to one-sixth of the cavity. In the first case the position of Fallopian tube and ovary is not mentioned in my notes, and the tumor was destroyed. In the second case the Fallopian tube, much enlarged, was spread out on the anterior surface of the main cyst, and the ovary, much atrophied, lay on the cyst-wall above the tube. In the third case the ovary was distinctly made out in the tumor-wall, and the tube was a prominent object over the top of the large cyst.

I shall now summarize such clinical features as, being in harmony with pathological facts, may fairly be regarded as worthy of trust in leading to a diagnosis.

1. In their growth the tumors are markedly a symmetrical. Springing as they do from the broad ligament and having no pedicle to permit their escape from the pelvis, they are fixed down on one side and cannot, when large, rise to the position of least pressure in the middle of the abdomen. Minor cysts bulge out where they can find room in the pelvis or on the side not occupied by the main cyst; but their aggregate bulk and arrangement is not such as to produce a balancing symmetry. Cases of ovarian disease are rarely so persistently one-sided and so irregular in shape as these, and they are not so deeply nor so firmly attached in the pelvis. With the rare

fibro-cystic disease of the uterus, so far as the few recorded cases show, cystic disease of the broad ligaments is less likely to be confounded.

2. Another peculiarity would seem to be the multiplicity of cystic growths. It is not merely a multi-locular cyst, one large cyst divided by septa into several; it is a development of several separate cysts, each sessile on a common base. This peculiarity is more marked in my cases than in those shortly related by Mr. Doran. In each was found one major cyst, and in each this cyst, from its papillomatous contents, appeared to fluctuate less freely than its companions. The others were crowded into the pelvis occupying Douglas's pouch and into the side of the abdomen unoccupied by the large cyst. Their walls were thin and fluctuation was usually plainly to be elicited.

3. A third peculiarity of papillomatous disease of the broad ligaments is its immobility. From the very beginning and all through its progress it is absolutely immovable, in its deeper parts at least, to such force as can safely be applied. In the pelvis through the vagina this sensation of resistance was peculiarly unyielding. It is doubly fixed by the broad ligament in which it mainly lies, and by the minor cysts packed in the pelvis which spring from it.

4. A fourth point is enlargement and elevation of the uterus. In my third case the uterus was drawn up out of reach, in the others it was elevated; in all it was much enlarged. That the uterus should be enlarged is readily conceivable from its close physical and vascular connection with the very vascular growth. That it should be elevated is a necessary consequence of the direction of the tumor's growth and of the attachment of the uterus to it. This enlargement was in excess of what is at all common in ovarian cystoma, even when adherent to the uterus. The situation of the uterus in these cases was midway between the cystic growths bulging over it, and placing it at the bottom of a sulcus visible through the abdominal walls; but it is conceivable that it might be completely overlapped in front and pushed backwards, or vice versa. If a sound introduced into the bladder showed elevation of that viscus, we should look upon it merely as a sequence of elevation of the uterus.

5. As a corollary from preceding propositions, we might infer physical interference with the processes of defæcation and micturition. The growth, being fixed in the pelvis and there undergoing enlargement, of necessity presses upon the hollow viscera. In the third case frequency of micturition was the most prominent symptom; in the other two it was marked enough to require special comment in my notes. In the third case, also, as might be expected, the difficulties in defæcation were most urgent. A curious feature in her case was that she could defæcate only when standing, probably because the sitting posture forced the growth downwards into the pelvis.

6. It would seem that papillomatous cysts everywhere are peculiarly liable to undergo rupture. In the second case there was an extraordinary and perhaps unique history of rupture on at least twelve occasions. In the first and third acute symptoms existed on several occasions which were compatible with rupture. Mr. Doran comments on this tendency of papillomatous cysts to burst, and lays particular stress on the clinical importance of this fact in reference to the likely result of general infection of the peritoneum. In my cases I think that any rupture which took place was not of the large papilloma-bearing cysts, but of the small thin-walled cysts not containing papilloma. Several puckered cicatrices in the sulci between these small cysts, which were observed after removal of the growths in two of the cases, lend probability to this view. Mere leakage through a small opening without the formation of a large rent, as it is pathologically the most common mode of escape of the fluid contents, would not produce very acute clinical signs. If the rupture is not of a large cyst, we should not expect much diminution in the size of the abdomen, nor marked relaxation in the tension of its walls.

# A CONTRIBUTION TO THE ETIOLOGY OF MALIGNANT TUMORS.

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SO much of an almost purely speculative character has been written during the last ten years on the etiology of malignant tumors that were this paper to contain merely a new hypothesis I should scarcely venture to present it to the surgical society.

It consists, however, chiefly of a series of cases, most of which have come under my own observation, which, in my judgment, strongly support that hypothesis which is slowly but surely working its way into the minds of most thinking pathologists and surgeons. I refer to the hypothesis which attributes these mysterious neoplasms to a specific virus, in all probability a micro-organism.

Without stopping to give an accurate definition of the term "tumor" in general, it may be sufficient to say that by malignant tumors we mean those that invade the neighboring tissues and produce metastases<sup>1</sup> and that all such tumors are included in two great classes, carcinoma and sarcoma. In regard to the first of these, almost all pathologists have accepted Waldeyer's view, that the cells which occupy the alveoli are epithelial, and the tumors, therefore, are essentially of epithelial origin; while there is no doubt whatever that the sarcomata are built up of connective tissue elements.

The theories hitherto formulated in regard to the origin of these tumors have been so well classified by Dr. H. F. Formad,<sup>2</sup> in an exhaustive paper on the same subject, that I cannot do better than reproduce this classification. Under each head-

ing he has given a list of the pathologists who have supported the hypothesis. The list is as follows :

(2). Predisposition and inflammation theory—Virchow, S. D. Gross, Woodward, Samuel, Wagner, Birch-Hirschfeld, Cornil and Ranvier, Perls, Tyson, S. W. Fitz, Gross.

(2). Dyscrasia theory—Rokitansky, Paget, Billroth, Simon.

(3). Embryonal theory—Cohnheim, Thiersch, Waldeyer, Lücke, Masse, Hasse, Epstein.

(4). Idiopathic or spontaneous—Rindfleisch, Stricker, Nancrede, Payne.

(5). Nervous theory—Van der Kolk, Lang, Snow.

The nervous theory is, I think I may safely say, too fanciful to merit discussion, except when considered as a possible predisposing cause. The idiopathic and dyscrasia theories mean nothing, the terms themselves being mere words which either confess our ignorance or serve as a cloak to hide it. Cohnheim's, or the embryonal theory, which has lately fallen into some discredit, undoubtedly offers a satisfactory explanation of the origin of some benign tumors, and may afford a beautiful explanation of one of the facts in regard to the structure of many malignant tumors apparently most difficult to reconcile with our hypothesis. For, if in certain regions, as in the parotid, embryonic remains are of frequent or constant occurrence, and in others occur rarely or not at all, we can understand why in the one case the same irritant should give us a mixed, in the other a simple tumor.

There remains, then, only the predisposition and inflammatory theory. Under the great authority of Virchow, pathologists have been ready enough to accept this last as a sufficient explanation; that they have been and are still very slow to recognize that the inflammation is of a specific kind is due, I think, chiefly to the following causes: When, following closely on his cellular pathology, it was demonstrated by Virchow that tumors consisted of cells not differing genetically from those found in normal tissues, the discovery excited such enthusiasm that many men were convinced that the life history of the cell alone could sufficiently account for all the phenomena. Thus, according to the widely accepted view of Thiersch, in old age the resistance of the connective tissue is diminished,

the interstitial spaces are widened; under some local irritation the deeper epithelial layers proliferate and penetrate the underlying tissues, penetrate the lymph spaces, and are swept into the neighboring lymphatic glands, where, in accordance with their life history, they develop indefinitely, and not being on a surface where constant desquamation can occur, must do so at the expense of surrounding tissues. Thiersch, while correctly recognizing the inflammatory character of at least one group of malignant tumors, the carcinomata, could not at that time make the distinction now clearly recognized between simple or non-infective inflammations and infective, and his followers, with less excuse, refuse to do so even now. We have many instances of local infective inflammations giving rise to metastases; not one, so far as I know, of the non-infective. The view that malignant tumors are of inflammatory origin is one which has spread widely among pathologists, especially since it has been found necessary to place the so-called granulomata, tubercle, lepra, and syphilis among the inflammatory diseases. The points of analogy between these and the malignant tumors are too numerous and obvious to have escaped observation. They have been presented at length by Dr. Formad in an exhaustive paper<sup>3</sup> and by Dr. Nedopil.<sup>4</sup> Time will only permit me to discuss them briefly to-night.

Tubercle, which may be taken as the representative of the granulomata, was long considered to be an ordinary inflammation in a tissue predisposed to disease. This is the standpoint which many pathologists occupy at present in regard to malignant disease. It is interesting to note that Formad,<sup>5</sup> whose weakness for peculiarities in the lymphatic system, as sufficient to account for the origin of tubercle led him to reject the tubercle bacillus, and brought down on him what can only be described as the annihilating criticisms of Professor Koch<sup>6</sup> and Dr. Shakespeare,<sup>7</sup> finds in the absence of the endothelium of the lymph spaces, in carcinomata and sarcomata, a sufficient explanation of their peculiar growth.

Numerous attempts have been made to show that the anatomical peculiarities of tubercle tissue—epithelioid cells, giant cells, cheesy degeneration—are sufficient to account for all the peculiarities of the disease. The researches of Baumgarten<sup>8</sup>

and Weigert<sup>9</sup> show that they represent only the reaction of the enfeebled cells under the irritation caused by the bacillus. A pathologist can hardly fail to be struck by the similarity of the enormously hypertrophied cells almost constantly found in sarcomata and carcinomata to the epithelioid and giant cells of tubercle, while the frequency with which they are found in a state of fatty degeneration, and the readiness with which they undergo spontaneous necrosis remind us forcibly of cheesy degeneration. The discussion is not yet quite terminated among pathologists as to whether tubercle tissue always differs so much from other inflammatory products as to make the microscopic diagnosis possible in every case. In the same way the exact line between certain sarcomata and the products of chronic inflammation has never yet been drawn, while that form of tubercular skin disease known as lupus papularis or verrucosis, commonest on the dorsum of the hand, and of undoubted inflammatory origin, is, as I have myself had occasion to observe, undistinguishable under the microscope from epithelioma<sup>10</sup>. Into what absurdities we may be led by regarding carcinoma as merely a non-specific inflammatory process is well shown by the statement of Formad<sup>11</sup> that there are great numbers of chronic ulcers of the leg in the Philadelphia hospitals, and that a large proportion of them are carcinomata—because he has found epithelial nests and proliferation of the interpapillary epithelium.

Both tuberculosis, as seen by the surgeon, and malignant tumors are distinctly associated with traumatisms. Thus Volkmann states that the great majority of tubercular bone and joint diseases are referable to an injury<sup>12</sup>, while Formad alleges that he finds an inflammatory origin in nearly one-half of all tumors.

Dr. O. G. Zesas quotes<sup>13</sup> S. Wolff's statistics drawn from tumor cases observed in the surgical clinic at Berlin between 1864 and 1873, according to which in 344 cases of carcinomata a trauma was given as the cause 42 times, and in 100 of sarcoma 20 times.

It is well known that sarcomata usually follow a single injury and carcinomata a long continued irritation. The reverse, however, is by no means unknown. Thus Weil<sup>14</sup> gives two

cases of sarcomata attributed to repeated irritation. Dr. R. F. Weir<sup>15</sup> has reported a case of scirrhus of the penis following a contusion received four months previously, and refers to a similar case reported by Holmes Coote<sup>16</sup>. J. W. Hulke\* reported a case, occurring in a man aged 68, in which a small wound of the palate, made by the stem of a pipe driven into the mouth, was followed in a month by a small wart, which grew rapidly, and six months after extirpation\* recurred, extended rapidly and caused the death of the patient. Microscopic examination proved the tumor to be an epithelioma.

If we deny the existence of a specific virus in these cases we are compelled to fall back upon the vague term predisposition, which was formerly used to explain the cases of tubercular disease having a similar origin. On the hypothesis of a non-specific inflammatory origin it would be difficult to account for the fact that in some countries malignant tumors are practically unknown<sup>17</sup>. For surely contusions and chronic inflammatory processes with diminished resisting power on the part of the connective tissue can not be wholly wanting in these places. One of the strongest objections made to the assumption of a specific poison in the case of malignant diseases has been the absence of any evidence of contagion. Cohnheim<sup>18</sup> denied the existence of a specific poison on the ground that the surgeon is never infected from his patient *or the husband from the wife*. It is well to remember that precisely the same objection was made to the tubercle bacillus. Many physicians of large experience declared that they had never seen a case of even probable tubercular infection; yet now the journals are filled with them, and while the surgeon seems still to be safe, the anatomist has not been spared<sup>19</sup>.

It is to meet this objection that I have ventured to present the following cases to the surgical society. Three of the series are from the practice of Dr. Sands, and one or both of the patients concerned in each case have come under my own observation; for the fourth I am indebted to Dr. Markoe, and the fifth was seen at the out-door department of the Roosevelt Hospital by myself.

CASE 1. Mr. Thomas E. C., æt. 40, married; New York, clerk. Admitted to Roosevelt Hospital December 3, 1878. Family history good.



Patient has varicocele on the left side, and tumor of the left testicle of twenty-two months growth, the size of a cocoa nut, smooth, firm and of fibrous consistency. Extirpation of the tumor January 3, 1879, by Dr. Sands. Death January 26, from suppression of urine, due to pressure on the ureters by metastatic growths in abdominal cavity. Microscopic examination by Dr. Delafield showed the tumor of testicle and in the abdominal cavity to be encephaloid carcinoma (19).

Mr. C.'s widow subsequently married. Margaret Anne, New York City, æt. 40 years and 3 months, died while under my care, April 12, 1885, with carcinoma "*en cuirasse*," originating in the mammæ. Tumors were stated to have been first noticed in 1882, and in both breasts at the same time. The growth was confined to the mammary glands and the skin. No enlargement of the axillary glands occurred, and only superficial ulceration of the carcinoma. Death due to repeated hæmorrhages from the ulcerating surface and to exhaustion. No autopsy obtained. Mrs. L.'s mother, Mary Anne D., died January 30, 1885, æt. 81 years and 6 months, of acute bronchitis and bronchopneumonia. One month before her death the patient consulted me with regard to a rapidly growing tumor of the right breast, which she had first noticed one month previously. My diagnosis was probable carcinoma. The tumor was seen also by Dr. Sands, who concurred with me. The family history of this patient was good, especially no history of tumors. She had been a good deal with her daughter during the illness of the latter, but did not live in the same house. No autopsy obtained.

CASE II. Mrs. D., æt. 43, with good family history, was subjected to operation by Dr. Sands on May 3, 1882, for carcinoma of the right breast of one year's duration. Recurrence took place about six months later, and the patient died about April, 1883. Microscopic examination by Dr. Satterthwaite showed tumor to be scirrhous carcinoma. Mr. George D., æt. 47, husband of the last patient, came under observation on October 20, 1882, suffering from tumor of the superior maxilla. A younger brother died five years ago of what was said to be recurrent sarcoma of the testicle. Family history otherwise good. About three months ago the patient noticed a swelling in the left superior maxillary region, and thinks he noticed a hard lump beneath the left angle of the lower jaw some time before this. Both tumors have grown rapidly since. A tumor of soft consistency occupies the situation of the left superior maxilla, and extends in the direction of the malar bone. There is a mass of enlarged glands beneath the left angle of the lower jaw. Extirpation of the tumor and enlarged glands by Dr. Sands. Rapid

recurrence and death in May, 1882. Microscopic examination shows the tumor to be an epithelioma.

CASE III. Miss Isabella S., admitted to Roosevelt Hospital May 25, 1885, suffering from a rapidly growing tumor involving the right superior maxilla, and said to be of three months' duration. Extirpation of the superior maxilla by Dr. Sands May 27, 1885. Death from shock and hæmorrhage following the operation. Microscopic examination shows the tumor to be a giant celled sarcoma. Mr. F. J. G., æt. 20, single, was engaged to Miss S. for some months before her death. He was submitted to a surgical operation on September 9, 1885, by Dr. Post for the removal of a small cystic tumor of the right superior maxilla, said to be of only three weeks' duration. The tumor lay in front of the antrum and did not occupy its cavity. Microscopic examination showed the tumor to be a giant-celled sarcoma.

CASE IV. Taken from Dr. Markoe's work on Diseases of Bones, p. 266, 1872. Mrs. S. N. E., æt. about 23, consulted Dr. Markoe March 26, 1866, for a small tumor occupying the right side of the neck, behind the sterno-mastoid, and about the size of a hickory nut. Operation May 1, 1866, when tumor was found closely attached to the transverse process of the fourth cervical vertebra. Recurrence after a few months, and slow growth until April 10, 1869, when a second operation was performed. Recurrence in fall of 1869, with gradually increasing paralysis due to pressure on spinal cord. Third operation on January 25, 1871, followed by complete relief of all the symptoms and no recurrence up to the present time. Microscopic examination by Dr. Delafield showed the tumor to be a myxo-sarcoma.

Mr. E., æt. 56, husband of the last patient, underwent on January 19, 1885, an exploratory incision of the abdomen to determine the nature of an abdominal tumor, the symptoms of which dated from December, 1884. A soft, friable tumor was found matting the viscera together in such a way as to prevent the possibility of its removal. The tumor was considered by Dr. Markoe to be sarcoma, probably originating in the great omentum. The patient died about three days after the operation. No autopsy was obtained.

CASE V. Thomas C., New York, æt. 53, September 4, 1885; family and personal history good, especially no history of tumors or syphilis. Sixteen years ago the patient broke his left arm near the elbow, but recovered without stiffness or deformity. One month ago the left elbow and the right ankle became swollen, and swelling has increased rapidly since, without pain, redness or tenderness, except over the internal malleolus, where the pain is quite severe. Examination shows

that the inferior extremities of the left humerus and the right tibia are expanded so as to form distinct tumors, being smooth and of bony hardness. The neighboring bones and articulations are unaffected. Diagnosis of simultaneous sarcoma of the humerus and tibia. The patient was examined by a number of surgeons, who all concurred in the diagnosis. The tumors were especially unlike in their growth and character, syphilitic or tubercular deposits, which almost alone might be supposed to come into consideration.

While taking the patient's history, I incidentally elicited the fact that his wife had died last February, after a six weeks' illness, with rapidly advancing hemiplegia of the left side, and that the diagnosis of the attending physician, Dr. A. R. Robinson, of this city, was tumor of the brain. Dr. Robinson, whose well-known skill as a pathologist lends weight to the diagnosis, informs me that the case was a well-marked one of rapidly growing tumor of the brain involving the motor areas about the fissure of Rolando, and so far as the diagnosis could be made clinically, undoubtedly sarcoma. Syphilis especially was carefully excluded.

I am well aware that these cases are not beyond criticism, especially on the ground of the absence, in some of the cases, of a microscopic examination. This, however, was unavoidable, and in none of the cases, except possibly the last, could there be much real doubt as to the nature of the disease.

In Case IV the long interval which appeared to exist between the last appearance of the disease in the wife and its occurrence in the husband may seem to deprive the case of all significance. When we consider, however, the extremely slow growth of the original tumor, as seen in Mrs. E., and how long a similar one may exist in the abdominal cavity without giving rise to symptoms the objection loses much of its weight. The length of time also that a tumor histologically malignant may remain latent as contrasted with the frequently rapid growth of the same or similar tumors is, I think, not sufficiently appreciated by pathologists, and offers another striking analogy to tubercular deposits. When a tumor which has remained quiescent for many years begins to grow and take on the character of malignancy, surgeons are apt to assume that it has undergone a histological change from a benign to a malignant growth. The following cases tend to prove that at least sometimes the assumption is unwarrantable.

CASE VI. A small tumor, about one half an inch in length by one-fourth of an inch in width, adherent to the skin but situated in the subcutaneous connective tissue, was removed by Dr. Markoe from the back of a healthy man, where it had existed for many years, with, I am informed, little or no change during that time. The tumor is a small round and spindle-celled sarcoma, with little inter-cellular substance, and having histologically all the characters of malignancy.

CASE VII. Minnie M., *æt.* 19, single, good family history. Noticed a tumor of the neck below the lobe of the left ear three years ago. Tumor is about the size of a pigeon's egg, and resembles a conglomerate of enlarged lymphatics. Patient states that it has scarcely grown or altered since first noticed. Extirpation May 25, 1885. Microscopic examination shows it to be a myxo-sarcoma and histologically very malignant.

CASE VIII. Miss T. Tumor in the same region, precisely similar to the former, occurring in healthy woman, *æt.* 21. Has existed for five or six years, and grown almost imperceptibly. Patient desires operation only because a brother had died about one year previously of sarcoma of the pharynx. Extirpation by Dr. Sands January 23, 1884. Microscopic examination shows the tumor to be almost exactly similar in structure to the last.

The possibility of direct inoculation of the human subject or of animals with malignant disease has been much discussed, and many experiments made, with generally negative or doubtful results. I have only been able to find in the literature of the subject two at all well authenticated cases of apparent inoculation. Meissner<sup>21</sup> states that in 104 cases of melanotic sarcoma one patient gave inoculation from a horse with the same disease as the cause. In the discussion on Dr. Formad's paper<sup>22</sup> Dr. S. W. Gross quoted from the *Mag. für die Ges. Thierheilkunde*, 1862, p. 328, the case of an ulcerated medullary sarcoma in an ox. A woman who cleaned the sore every day acquired a tumor of the outer side of the fourth finger of the left hand. Kuhn examined the tumor and found it to be a medullary sarcoma. Among cases of supposed contagion which can scarcely be accepted as evidence, Hyverth\* refers to cases of contagion reported by Tulpus,<sup>†</sup> and to those to which have been attributed the deaths of Smith and Beltinger. In a discussion by Dr. Mundé<sup>‡</sup> on cancer of the penis and contagion, the author states that Demarquay, in an analy-

sis of 134 cases, found one where local contagion was alleged, and that Dr. Welch quotes Langenbeck as saying that he had seen three or four cases caused in the same way. Dr. T. Gail-  
lard Thomas|| states he has only met with one case of cancer of the penis in which contagion seemed to be probable.

There are a great number of unsuccessful or doubtful inoculations of animals, for an account of which I must refer to the general literature given below, and especially to Dr. Formad's article. The only experiments which seem beyond question are those of Professor Klencke,<sup>23</sup> who inoculated a dog in the jugular vein and a horse in the conjunctiva with juice from a pigment carcinoma taken from a mare. In the horse in sixteen weeks the lachrymal gland was transformed into a melanotic tumor; the dog died in three months and melanotic tumor masses were found in the lungs. Novinski<sup>24</sup> made 27 inoculations of carcinoma from the nose of a dog into inflamed tissue and 15 into normal skin. All of the first were negative. Two of the last positive. Successful experiment: A small piece of carcinoma (2 mm.) was introduced into a fresh wound of the skin of the back. The wound healed per primam. In 14 days the fragment had reached the size of a pea, in three months, that of a walnut. Four months after the inoculation the dog was killed. The tumor measured three and a half inches in diameter, was soft and white in section. The lymphatic glands in the subclavicular region were much swollen. Microscopic examination of the tumor showed the peripheral part to be made up of closely lying polygonal cells, of epithelial character and varying in size, infiltrating the surrounding connective tissue. In the centre were alveoli of various sizes, with more or less fine tubercles and similar epithelial cells. The same structure occurred in the lymphatic glands.

A young dog was then inoculated with a piece of this tumor, but died half a month later (of pestkrankheit). Examination showed a small tumor at point of inoculation; no metastases. Tumor showed typical cancerous structure. Dr. Gougon (A) gives two cases which do not appear quite so conclusive. He injected melanotic masses into the left thigh of a dog and killed the animal after two weeks. At the point of injection was found a melanotic tumor the size of a thaler, and pigment in

the lymph vessels and neighboring lymphatic glands. The lymphatic glands, including the bronchial, were enlarged and pigmented. Lungs free. The same material was injected into the peritoneal cavity of a second dog, which was killed 43 days later. At point of injection and in the mesentery were deposits of pigment. In one horn of the uterus were two pigmented tumors. Few glands were affected; one much enlarged inguinal gland. The bronchial glands were pigmented, but this was possibly from the lungs. All the pigment was in epithelial cells, but these were not similar to those of the tumor injected.

There is another way, however, of studying the subject. It will not be denied that there is not at present a pathologist of eminence who does not teach that malignant tumors are at first purely local. Could it be shown that carcinoma and sarcoma could be transmitted from man to man or from man to animals, the idea that nothing but the cell was inoculated would not be able to hold its place in scientific opinion for six months. We have passed the stage when it was possible to believe that an infectious disease can be of spontaneous origin. Yet if the disease be at first purely local the inoculation of a distant portion of the body in the same patient, the so-called contact infection is as valuable as the inoculation of another person would be. Cases of this kind are not rare in literature. The chief recorded instances are the following:

Dr. M. Nedopil (O) quotes a case narrated by Lücke of ulcerated carcinoma of the edge of the tongue, with inoculation of the mucous membrane of the cheek on the same side; a case by Kauffmann, in which a woman had cancer of the dorsum of the right hand and subsequently of the conjunctiva of the right eye. Her relatives stated that she constantly wiped the right eye with the back of the right hand. Cases by Ahlfeld, Hegar, and Spiegelberg, of direct inoculation of the vagina from the uterus, and cases by Klebs of inoculation of cancer of the tongue in the stomach. J. Reincke<sup>25</sup> gives two cases in which carcinoma developed in the punctures made to relieve ascites due to carcinomatous peritonitis. Prof. H. Quincke<sup>26</sup> gives a similar case. C. Bartsch,<sup>27</sup> in giving statistics of carcinoma of the lips, penis and vulva relates one case of possible contact infection. P. Kraske<sup>29</sup> gives two cases of rectal car-

cinoma in which small secondary tumors were found at a lower point, separated by healthy mucous membrane from the primary growth, and refers to Virchow's (29) well-known observation on the peculiar distribution of carcinoma of the peritoneum secondary to carcinoma of the stomach; to the cases of Lücke<sup>30</sup>, Kauffmann<sup>31</sup>, and Klebs<sup>32</sup> mentioned above, and to a case by Erbse<sup>33</sup>, in which a carcinoma of the œsophagus perforated the trachea and gave rise to secondary tumors in the lower lobes of the lungs.

Beck<sup>34</sup> records the following three cases from the institute of Chiari, Prague: 1. Ulcerating cancer of œsophagus. In anterior part of lower end of œsophagus and in stomach tumor of the same character—flat epithelial carcinoma. 2. Two carcinomata of the œsophagus separated by healthy tissue. The author admits the possibility of both being primary. 3. Multiple lymphadenoid round-celled sarcoma of most of the lymphatic glands, the lungs, spleen, and posterior surface of the stomach. In the ileum numerous similar nodules, not corresponding to Pyer's patches. In the cœcum an infiltration of almost the whole intestinal wall. The author excludes on various grounds all the other situations, and considers the growth in the cœcum as primary, and the other tumors in the intestinal tract as due to contact infection, the tumor particles being carried back by antiperistalsis; the tumor of the cœcum being ulcerated and having caused much obstruction.

Beck quotes also a case by Hjelt of carcinoma of the ileum and colon with primary cancer of the duodenum.

Two cases of the kind have come under my own observation, as follows:

CASE IX. Mr. A., an elderly gentleman, probably between 50 and 60, suffered for several years from a slowly growing epithelioma of the floor of the mouth on the left side and encroaching on the posterior surface of the gum. Several operations were performed by Dr. Sands at varying intervals, with temporary success, but recurrence after periods varying from two or three years to several months. After the fourth operation, December 18, 1884, rapid recurrence took place. A flat epithelioma developed on the hard palate, first at the point where the tip of the tongue, constantly in contact with the epithelioma in the floor of the mouth, would frequently impinge. The diagnosis in this case was confirmed by repeated microscopic examinations.

CASE X. Mary M., æt. 44, single, March 29, 1885. Family history good. No case of malignant disease known. Carcinoma of right mamma first noticed two years ago. Amputation of breast one year later. Axilla not opened. Recurrence noticed last October. Patient first seen March 29, 1885, suffering from carcinoma, recurrent in cicatrix of operation, the new growth extending as nodular masses, ulcerated in part, over almost the whole of the right side of the thorax, anteriorly, laterally and posteriorly to the external border of the scapula. Axillary glands on the same side much enlarged and the whole right extremity enormously swollen, œdematous and painful. On left side of the thorax, above the mamma, and on the left shoulder, are several isolated, not ulcerated, cancerous nodules, varying in size from that of a split pea to three-fourths of an inch in diameter, and not extending beneath the skin. Profuse sero-purulent discharge from the ulcers. Patient was last seen June 23, 1885, when the carcinoma had extended over the upper part of the abdomen, and a great part of the right scapula and shoulder. Ulceration of the carcinomatous masses in the axilla had occurred. The discharge from the ulcers on the shoulder and in the axilla constantly runs down on the anterior and internal surfaces of the arm and forearm, to the wrist, exciting an eczema and inducing the patient to scratch. *All along this surface are cancerous nodules in the skin*, generally ulcerated or excoriated on the surface; some isolated, others confluent, and extending to the wrist. Died of exhaustion July 10, 1885.

I may mention here one or two more interesting points of analogy between tubercle and malignant tumors. The former appears usually as a more or less chronic and localized disease. It occurs also as an acute infectious disease—acute miliary tuberculosis—involving the different organs with a rapidity that was a complete mystery to the pathologist until the views of Weigert,<sup>†</sup> founded on careful anatomical research, were confirmed by the demonstration by Weichselbaum<sup>35</sup>, Baumgarten<sup>36</sup>, and others, of tubercle bacilli in the blood. Raymond and Brodeur<sup>37</sup> record a case of primary acute miliary carcinosis, and refer to two similar cases by Charcot. Numerous cases have been reported during the last few years of general tuberculosis following operation on a local process, the operative interference having obviously opened the way for the bacillus into the general circulation<sup>38</sup>. A precisely similar general cancerous infection has been reported by Dr. Schweninger<sup>39</sup> as follows:



Girl, æt. 17, single. Operation for colloid carcinoma of both ovaries. The tumors were punctured shortly before the operation for diagnostic purposes. During the operation one of the tumors was torn. No reaction. Wound practically healed in 10 to 11 days. From this time on a continued fever, of remittent character, diminished power and sensibility in left arm and leg, with severe neuralgic pains and cramps in the affected extremities. Rapid extension of these symptoms to right side, bronchial catarrh, increasing weakness, and death thirty-six days after the operation. Postmortem examination showed that the peritoneum was thickly covered with carcinomatous nodules, varying in size from that of the head of a pin to a pea. Similar nodules in the liver, spleen, beneath the pleura, and in the parenchyma of the lungs, and on the surface of the dura mater. In the interior of the brain was a colloid tumor, about the size of a hen's egg.

Finally, it is with some hesitation that I state that I have found bacilli in a single case of rapidly growing, not ulcerated, large celled sarcoma of the occipital region, occurring in a woman, and extirpated by Dr. Sands during the past year. The tumor tissue had been kept in 95 per cent alcohol since the operation, and the sections were stained with fuchsin by a slight modification of DeGiacomi's <sup>10</sup> method for staining the bacillus of Lustgarten. The modification consisted merely in more prolonged immersion in the staining fluid and may not have been essential. Every precaution was taken in the way of using sterilized vessels, reagents, etc. Of the two sections examined bacilli were found very sparingly in only one, and after prolonged examination. The examination was made with a Zeiss oil immersion one twelfth and Vêrick eye No. 3, using, of course, the Abbè condenser. Though few in number, the bacilli found were very distinct, only one being situated in each cell, straight, and apparently somewhat longer and plumper in proportion to their length than the tubercle bacilli. I know well, of course, that little or no scientific value attaches to a single observation of the kind by one man, unsupported by the evidence of any others, but mention it because it may acquire some if confirmed by future research, and at least serves to show that my work is not all theoretical, but practical as well.

## LITERATURE.

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# ON DISARTICULATION AT THE HIP JOINT AND ON A NEW MODE OF DOING IT.

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IT would scarcely be inaccurate to say that a few years ago the spectators assembled in a hospital theatre where amputation through the hip joint was about to be performed, regarded themselves rather as come to witness a sensation and a display of dexterity than as being present to quietly study a means of saving life. They knew too well how small the chances were possessed by the patient, I had almost said the "victim," of preserving the life for which he was about to sacrifice a whole limb.

But the extraordinary surgical activity of our time has transformed all this, and it is difficult to decide which is the more astonishing, the rapidity or the thoroughness of the change.

The fatality of the operation as formerly practised was mainly due to three things, namely, shock, hæmorrhage, and the dangers associated with an immense, suppurating and septic surface. Each of these enemies has been reconnoitred, attacked and repulsed, if not crushingly defeated, and the whole battle fought so far with science and fore-thought, blind fortune having no more to do with the matter than she had to do with the plans of Moltke and Bismarck in 1870.

The first evil to be dealt with was the hæmorrhage, and the first important step with regard to it was the invention of the large tourniquet for compression of the abdominal aorta. This goes by Lister's name and the form in common use is undoubtedly due to him. But he does not claim to be the first surgeon to compress the aorta during amputation of the thigh,

and a tourniquet for compressing the abdominal aorta for general purposes was invented many years ago by an old student of St. Bartholomew's Hospital. The late Mr. Holmes Coote used to shew it in his lectures. The first person to recommend and to employ the aortic tourniquet during disarticulation of the hip was Professor Pancoast of Philadelphia.

Esmarch introduced the principle of elasticity into aortic compression. He did not, however, allow his elastic bands to constrict the whole trunk as they do the limbs, but confined the pressure almost entirely to the region of the great vessels by placing a long traverse bar of iron or wood across the patient's back and attaching the compressive elastic bands to the ends of the bar, so that the bands bore to the bar the same relation that a bowstring does to a bow, and the patient's waist lay between the two.

In May, 1878, Mr. Richard Davy described his lever for compressing the iliac artery or the aorta, *per rectum*. The directness of action, the handiness, simplicity and other obvious advantages of this instrument at once brought it into favor; and it has ever since done great service. But unfortunately one or two serious accidents have attended its use.

Again, Esmarch's band may be used in the ordinary way if a pad be placed over the iliac artery beneath the rubber tourniquet and an assistant prevent the latter from slipping downwards by holding firmly loops of bandage placed beneath the tourniquet before and behind. Mr. Jordan Lloyd was one of the first surgeons to adopt this plan, which I am inclined to think has advantages over all others.

In the Glasgow Medical Journal for 1881, page 150, is noticed a method of using what might be termed a kind of acupuncture on a large scale. This consists of transfixing with a steel rod and passing a figure of 8 elastic band over its ends. This was devised by Newman and Trendelenburg, independently.

But, in their endeavors to lessen the hæmorrhage associated with this formidable operation, surgeons have not confined their attention to tourniquets and bandages. The method of operating has been greatly governed by the same influence, and in various ways.

At one time it was thought enough to operate quickly and that a smart assistant should be ready to instantly seize the upper flap and control the vessels. To this period belongs the historical anecdote of the dashing operator who slashed off his assistant's fingers and the tail of the chloroformist's coat.

I hope I shall not be thought to throw ridicule on speed in amputating.

One of the first operative procedures specially planned with a view to lessen hæmorrhage was that of commencing with ligation of the femoral artery through a longitudinal incision over that vessel. Among the advocates for this were Roser, Pitha, Volkmann, Verneuil and König. Most of these also ligatured the vein. From the lower end of the longitudinal incision a circular cut was carried round the limb. The amputation was consequently what is known as an oval one.

König points out that the incision made with a view to resection can in a similar way be turned into that for an oval amputation, if upon bringing the joint into view, the surgeon prefers exarticulation to excision. (*Text-book of Special Surgery*, Vol. 2, p. 898, 1879.) Spence had long before written similarly of the shoulder joint.

It is thus obvious that the times were ripe for the further advance, a most important one, which was now made by Mr. Furneaux Jordan.

The Birmingham surgeon grasped the position in a manner which all who know him will recognize as characteristic, and in a case described in the *Lancet* for March 22, 1879, he amputated through the thigh after disarticulating the bone through an external longitudinal incision.

Thus what König had pointed out as merely a plan available under exceptional circumstances, Jordan advocates as the right procedure for general use; and I believe that further experience has only tended to support Jordan's view.

In justice to Volkmann, it should be stated that the latter, according to König, had already recommended an operation similar to that of Jordan, but with the two stages inversed. That is to say, first a circular amputation was done through the middle of the thigh and then the upper part of the femur was extirpated. The disarticulation was directed to be done superiosteally, an undoubted improvement.



But, in the volume from which I am quoting it is not made clear that either Volkmann or König had ever done this operation which the former recommends and the latter warmly endorses.

Lister, in *Holmes's System* (3d edition, 1885), relates that many years ago an operation precisely similar to Volkmann's, except that it was not superiosteal, was done by one of his (Lister's) colleagues in the Glasgow Infirmary. The patient suffered from malignant sarcoma of the femur, and the surgeon began by amputating through the thigh in the hope that the upper part of the femur might not be diseased. Mr. Lee also in the *Lancet* for 1866 recorded a case in which he transformed an incision for resection into an oval amputation.

But these cases seem to have been merely instances of resource under special circumstances.

The credit for the new operations should plainly be given to Jordan and Volkmann.

Luening and Rose recommend that the femoral vessels should be encircled by a double ligature and afterwards divided between. As the operation progresses, the vessels in the soft parts are tied both centrally and peripherally, so that bleeding is stopped in the anterior flap before the posterior is cut.

It is unnecessary to point out that most, if not all, of the above proceedings are meant to lessen shock as well as hæmorrhage. The diminished shock is partly due to the lessened hæmorrhage and partly to the amputation removing less of the soft parts of the limb and partly to the extent of cut surface being far less than that which results from the common flap amputation. If care be taken to adopt all the hæmostatic measures now at the surgeon's disposal, I believe it will be found that more shock results from the process of removing the upper extremity of the femur from its bed than from the amputation through the soft tissues of the thigh. This was very noticeable in the case I shall relate presently. According to my experience, resection of the hip is always attended with more or less shock, whereas I have frequently seen amputation of the thigh produce very little. It is, perhaps, mainly dependent on the amount of hæmorrhage.

Besides the avoidance of shock and hæmorrhage there is another indication of equal importance, namely, to amputate in the way most calculated to protect from septic influences. The old operation had the vile effect of making an immense wound which lay in immediate proximity to the anus in both sexes and to the vagina in the female. Every form of the oval method has an immense advantage in this respect.

All that which may be termed the resection part of the wound can be immediately obliterated by buried sutures, hare lip pins and the like, for it is a simple longitudinal cut, the opposite surfaces of which fit together perfectly.

There is *another indication* only of less importance than those already considered, because it is not concerned with the saving of life. I refer to *the desirability of obtaining a stump which will permit the wearing of a useful artificial limb*. This indication was wholly unfulfilled by the old flap operation.

Ollier and others have been strongly of opinion that this object would be satisfactorily fulfilled by operating subperiosteally. Thus they said new bone would be formed in the stump; and new bone is undoubtedly formed in such stumps, but only to a very small extent. Moreover, the muscular attachments were less wholly disordered, so that such stumps are firmer, stronger and more fleshy. For all that, what I have observed in two such cases, and indeed in very high amputations through the thigh bone, convinces me that the results of subperiosteal exarticulation of the hip are scarcely if at all better than those of the old operation. One of the best of these stumps belongs to a patient of a surgeon who presented the man with a beautiful artificial limb made by one of the best makers in London. When the poor fellow does take his limb about with him, not a frequent occurrence, he carries it under his arm. All such patients use and prefer crutches.

I will now bring this somewhat long critical and historical introduction to a close and proceed to relate a case of my own.

On April 24th of this year, 1885, at the West London Hospital, I was about to disarticulate the hip of a girl named Clara Davies, aged 13. She suffered from hopelessly advanced morbus coxæ with amyloid disease, albuminuria and general ana-

sarca to a marked degree. Her legs were swollen to an enormous size, and her face was puffed to a corresponding degree.

I formed a plan of action based upon the following main considerations and certain subsidiary ones.

1. Even after subperiosteal disarticulation, the patient seldom or never uses the artificial limbs provided for him, the stump being practically as useless as after the flap operation.

2. However far down the shaft of the femur the disease may have extended it is generally confined to the medulla.

3. The entire medulla can be safely removed from the shaft of the femur and the cavity treated with powerful germicides.<sup>1</sup>

4. *If, in a case of exarticulation of the hip, the operation be divided into two parts done on separate days, so that the patient have time to recover from the shock of one before the other is inflicted on him, he will be more likely to survive than if the total shock is given at one operation.*

An important subsidiary consideration in connection with morbus coxæ is that the discharging apertures, however numerous, are generally entirely those of tubular sinuses which can be scraped out, disinfected and threaded with large drainage tubes.

Accordingly, I first excised the trochanteric part of the femur with the remains of the head, at the same time dealing with the acetabulum, and scraping out all the sinuses, inserting large drainage tubes freely. Owing to the depth of the parts, the incision for this was nine inches long.

Forty-eight hours afterwards I amputated through the femur near the junction of the shaft with the lower epiphysis, and after scraping away all the medulla, used iodoform freely, and closed the amputation wound with buried sutures, uniting periosteum, muscles, and skin flaps separately.

The following notes are by the house surgeon, Mr. Warner.

"April 24, 3:30 P. M.—Patient was brought down into theatre and put under ether. Mr. Keetley made an incision over the situation of the femur from about two inches above the trochanter, extending nine inches down the thigh. He cut through the tissues and came down upon the femur, the upper part of which was in a state of necrosis.

<sup>1</sup> See Annals of Surgery, Jan., 1885.

He removed the upper third of the femur with bone forceps, separating the periosteum and leaving it. He then scraped the acetabulum and all the sinuses. Drainage tubes were inserted into the latter and one large one,  $\frac{2}{3}$  inch in diameter, into the wound. Two sponges soaked in sublimate solution were packed respectively into the opposite ends of the wound to check oozing from the bone. All the sinuses and the wound were copiously syringed with sublimate solution, and into the latter iodoform was freely dusted. The lips of the wound were united with hare-lip pins, with intervening interrupted sutures. The whole was dressed with sero-sublimate gauze and an elastic bandage applied."

Great pains were taken to prevent hæmorrhage. Owing to dropsical distension, the lips of the wound were very thick and there was great tension on the hare-lip pins and sutures.

"9:30 P. M.—Temp. 98, pulse 126. Patient vomited twice after taking milk and brandy, but otherwise rallied well and was comfortable. There was considerable oozing of serum. The draw sheets had to be changed. Weight and extension applied.

"25th.—Patient has passed a comfortable night. Slept well. She is comfortable and cheerful this morning. Pulse 162. Temp. 100.

"April 26th.—Had a very good night and slept well. Œdema of the face much less. Escape of dropsical fluid from leg still persistent. Pulse 150. Temp. 98.8. No pain. The patient having been put lightly under the influence of ether and an Esmarch's coil having been applied, Mr. Keetley amputated the thigh through the lower third, cutting short antero-posterior flaps. He made the anterior flap first, then cut through the bone, the periosteum having been retracted, and then made the posterior flap. There was very little bleeding, only three arteries having to be secured. There was a very great effusion of dropsical fluid. The medullary cavity of the remaining part of the femoral shaft was now scraped out with a Volkmann's spoon, which removed a pulpy degenerated mass. The hollow cavity having been treated with iodoform, the periosteum was united with catgut sutures, over the end of the bone. The muscles, etc., were also united by buried sutures, and the tissues from within outwards were in the same way united to each other. A short drainage tube was inserted and the skin edges joined by silver sutures. The stump being supported and raised, the large drainage tube was removed from the excision wound and the finger, passed in at that spot, used to withdraw the two sponges. They had now been drawn near together by the retraction of the portion of femur towards the acetabulum. The lower sponge was firmly adherent in its place and had to be loosened carefully. The large drainage tube was re-inserted.

The patient bore the operation remarkably well. The pulse remained strong and not more frequent than in the morning. The temperature, which last night had reached 101, was this evening only 100.

"April 27th.—Has passed a very good night. P. 162. Temp. 98.8. Quite cheerful. Good appetite, eating fish and pudding. Evening: Pulse 144. Temp. 99.6."

After this time, for a month, the temperature only once rose above 99, and then only to 99.6. The pulse also diminished in frequency and the albumen in amount, the latter from one-fourth to one-eighth, and then, in the third week, to a trace, and before the fourth week to nothing. On the twenty-sixth day it reappeared and tended to increase.

It was on the twenty-third day after the first operation that she was attacked with a diarrhoea which afterwards continued and resisted, with obstinacy, all efforts to check it. Three days afterwards the return of albumen in the urine was noted; the amount, one-sixth. The remedies tried were bismuth, catechu, aromatic chalk powder, nitro-hydrochloric acid, sulphuric acid and, cautiously, small doses of opium. The lotion which had been used to wash out the sinuses when the wound was dressed was sublimate (1 in 1000).

The notes of the case do not state when the drainage tubes were removed. I was away from England during the whole of this first month following the operation. When I returned I felt convinced that her only chance lay in removal from the town hospital to the sea-side. I fitted a fenestrated plaster case on the waist, hip and stump, got her up and prevailed on her friends, who were much better off than the ordinary class of hospital patients, to take her out every day for an airing in a perambulator, but they declined to pay the expense of sending her to Margate, where she ought to have gone. After a month of this, the diarrhoea continuing all the time, I sent her home. Although this was into the heart of London, the change seemed to benefit her at first. The urgent way in which I put the question of sending her to the sea-side to her father (the unfortunate little thing had no mother) made him impatient of my advice, and during the last month of her existence she had practically no medical treatment. One of my dressers used to occasionally call to see her, but I doubt if his advice was followed.

I do not think myself that her death was to be attributed to the operation. I believe that if my health had permitted me to carry out my own plans myself, and the family circumstances of the child, which I can scarcely explain in this paper, had been different, her life might have been saved.

The operation was only a part of my complete plan. The whole was as follows:

(1) After doing the operations, to leave in the drainage tubes for several weeks and indeed only remove them very gradually, making sure that the sinuses were closed up behind them.

(2) To use perchloride lotion only for the primary disinfection, afterwards relying on bismuth, zinc sulphate and, if necessary, other astringents to dry up the wound.

(3) Within the first fortnight to fix the hip with plaster of Paris, even if the quantity of discharge should demand the construction of a fresh case twice a week.

Bismuth, zinc sulphate and fixation by plaster of Paris are three all but all-powerful agents for stopping discharge.

Lastly, I only operated on the distinct understanding that the child was, when I should direct it, to be sent down to the neighborhood of Margate, the best locality in England for such cases, where, moreover, there was a surgeon on whom I could rely for the enthusiastic seconding of my plans.

But the fates fought against me.

Of course, a complete and decisive explanation of the case and the diarrhœa which undoubtedly brought about the end, is, in the absence of a post-mortem, impossible.

Was the diarrhœa due to tuberculous disease of the intestine, or to amyloid disease, or to septicæmia, or to sublimate poisoning?

It should be stated that the evening temperature throughout the second month was almost invariably 99, except that it five times rose to 100.

The diagrams will explain the operation, if "C" is understood to point out the situation of the acetabulum, and "A" the upper point, and "B" the lower point of section of the femur. Only very short flaps are required, as the muscular retraction acts mainly to draw the bone preserved up to the acetabulum.

The operation would doubtless be applicable to some cases of injury.

In growing children the lower section might be made through the condyles below the epiphysial cartilage. Or the

amputation might be done through the knee-joint. In either case, there are two modes of dealing with diseased medulla, viz :—

(1) The medullary cavity is reached from below by piercing the lower femoral epiphysis between the condyles.

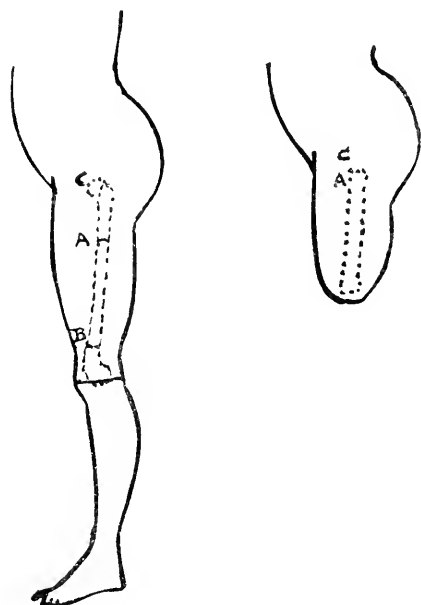


DIAGRAM ILLUSTRATING NEW METHOD OF DISARTICULATION AT HIP-JOINT.

(2) The medulla can all be scraped out through the wound made for the resection.

Some surgeons may ask, "why amputate at all for disease confined to the hip joint and its neighborhood?" That is a fair question, but it is far too large a one to be discussed at length here. I believe myself that any form of amputation for hip joint disease is very rarely justifiable. The exceptions do not all belong to the same class. The case I have related is a type of those in which the prime indication is to bring suppuration to an end by some means or other.

## DIRECTIONS FOR THE PREPARATION OF PARAFFINE MOLDS FOR PLASTER CASTS.

By F. L. TETAMORE, M.D.,

OF NYACK, N. Y.

PREPARE the specimen or preparation, making it as clean as possible, place on oiled paper in a position that will show it to advantage. Soft projections may be held in position with threads suspended from a frame, or from a heavy cord stretched across the room. Paraffine melted in a water bath is painted over the preparation with a soft brush, the first layer being put on with single and quick strokes, that the rapid cooling of the paraffine may not cause the brush to adhere to the preparation, thus drawing the soft tissues out of place, until the mold is formed about  $\frac{1}{8}$  inch thick; all undercuts must be well filled. When the mold is hard it can be readily separated from the preparation: it is then well washed with cold water. Stir fine dental plaster into cold water to consistency of cream. pour into the mold and out again several times, so that there will be no air bubbles on the surface, then fill the mold and let it stand until hard. Place the whole in a vessel containing boiling water until the paraffine is all melted, wash with clean boiling water. When the cast is thoroughly dry it may be painted with oil colors by coating it first with shellac varnish. Casts of any part of the body may be made from a living subject if the parts are not too sensitive to bear the heat of the paraffine, which is about  $150^{\circ}$  F.



ANNOUNCEMENT FOR 1886.

# ANNALS OF SURGERY.

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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*Published Simultaneously in the United States and Great Britain*

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EDITED BY

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The **ANNALS OF SURGERY**, a large-sized monthly periodical devoted exclusively to Surgical Science and Practice, is edited with unusual ability and is published in excellent style. All who wish to keep well informed in regard to the progress of surgical literature and art, will find it an indispensable aid. N. S. DAVIS, M. D., Chicago, Ill., Editor of the Journal of the American Medical Association.

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## EDITORIAL ARTICLES.

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### LANDERER'S MECHANICAL THEORY OF INFLAMMATION.

Inflammation has been regarded as arising from very different causes and conditions at different periods in the development of medical knowledge, some schools attributing the phenomena to changes in the blood itself, while others considered the walls of the capillaries; others, again, the nerves and muscles of the blood-vessels, to be primarily affected; and a fourth school believes inflammation due to changes occurring in the tissues surrounding the capillaries.

Thus Bôerhave and Hunter held that the elements of the blood were rendered more adhesive and thus produced the initial stasis, the main feature in inflammation, just as Magendie and Poiseuille spoke of greater viscosity of the blood in inflamed districts as producing a slowing of the current, and Rokitansky ascribed the change to some qualitative alteration in the blood, Simon to the presence of fibrin, and Cruveilhier to the coagulation of the blood in the capillaries.

But after it had been shown that an increased velocity of the current precedes the stasis in inflammation, and Paget had observed that blood did not coagulate in occluded capillaries for a space of three days, nor, even when let out, more rapidly than other blood—a new school appeared headed by Cohnheim, who held an impairment of the walls of the vessels to be the primary cause of inflammation, in consequence of which fluid media and corpuscles could extravasate into the surrounding tissues. But this theory does not satisfactorily account for the fact that the initial acceleration of the current is diminished in the second stage and slowing obtains.

Other doctrines relating to affections of the nervous and muscular system of the vessels were advanced by Brücke, Eisenmann and Henle; the two former maintaining that spasm of the vessels, brought about either by a reflex or direct action of a stimulus, rendered the parts

anæmic and caused, finally, a slowing or stoppage of the current; but the reaction after such a contraction would induce a subsequent paralysis and the current would have to become accelerated in the second stage, contrary to the actual facts.

Henle, who holds paralysis of the vessels to be the initial step towards inflammation, would have us believe that distension of a vessel causes slowing of the current, whereas this is not the case with capillaries, as Poiseuille and Jacobson have shown.

More recently theories ascribing inflammatory action to changes in the surrounding tissues, as formerly advocated by Broussai, have found followers. Virchow, indeed, believes the tissues capable of being so affected by irritants as to enable them to attract certain substances out of the blood and retain them. But these theories, again, do not sufficiently account for the circulatory phenomena.

In a lecture held before the Medical Society of Leipzig, and which has very recently appeared in pamphlet form in Volkmann's *Sammlung klinischer Vorträge*<sup>1</sup> Dr. Landerer, a brilliant young surgeon and docent of that university, from whose sketch we have taken the foregoing short survey, pointed out that in spite of the diversity of all these opinions, there is one point which bears upon all the observations made with regard to the exciting causes of inflammation, that is, that all agents capable of exciting inflammation are also capable, in a greater or less degree, of damaging or destroying the organism.

Heat, cold, traumatic injuries, chemical action, micro-organisms, stoppage of circulation—all these causes exciting inflammation, are capable, if applied with greater energy, of destroying the parts. Unbiased observation shows that, generally speaking, the tissues are first attacked by these agents, and it is only when they are introduced into the parts affected by way of the circulation, that the blood vessels and capillaries are, naturally, primarily affected. In such cases, however, the action is slower. Nor does it materially alter the course of events whether these agents are applied to paralyzed or enervated parts, showing how untenable those doctrines are which seek an explanation of inflammation in nervous affections, which are also rendered improbable

<sup>1</sup> No. 259. "Zur Lehre von der Entzündung." *Innere Medicin.* No. 89. Sept. 28. 1885.

since the ophthalmia occurring after section of the fifth nerve has recently been proved beyond all doubt to be simply traumatic in origin, and sympathetic ophthalmia to be due to direct invasion of micro-organisms into the healthy eye from the diseased eye by way of the sheath of the optic nerve. What elements of the tissues are first attacked by excitants of inflammation is a further point of interest. Experiments of the last few years have shown that if the blood supply to a certain organ be shut off, all elements of tissue do not perish equally rapidly; in kidneys thus rendered anæmic it is the epithelial structures, in the spinal marrow the grey matter, which is first destroyed.

The fact that inflammation is connected with injuries to the tissues is not altogether new. The writings of Klebs, Weigert and others, and, in fact, modern bacteriology as a whole, point to this idea. But still there remains a hiatus to be filled up: to satisfactorily connect the circulatory phenomena of inflammation with this destruction of tissue. And here it is that the author advances his theory to bridge over this gap—a theory which, founded simply on the maxims of physical science, completely, in his opinion, covers all the points wherein other ones, heretofore advanced, fail. He arrives at his conclusions by the following process of reasoning:

Heretofore attention has only been paid to the fluid coursing in the capillary vessels and to the structural details of the walls of these vessels, without, however, considering if these capillaries as a whole were of themselves sufficiently firmly constructed to sustain the intra-vascular pressure alone. Now, we can more or less accurately measure, by certain experiments first performed by von Kries, the pressure inside of the capillaries, and we find that nowhere is this pressure less than 20 millimetres of mercury, or about 250 mm. of water, but frequently twice or three times that amount. But the fine endothelial structure of the capillaries alone is not capable of sustaining so great a pressure. We know that the subcutaneous and perivascular tissue-spaces also show a certain manometrical pressure, corresponding to and varying with the intravascular blood-pressure, and especially we are able to accurately measure the pressure existing in the cranial cavity exercised by the liquor cerebro-spinalis; this pressure amounts, on an average,

to about 200 mm. of water. If we now average the intra-capillary pressure at 300 mm. of water, and compare it with the extra-vascular pressure of 100 mm. of water, we see that there remains the amount of 100 mm. of water to be borne by the walls of the capillaries themselves, not only in the surface of the brain, but, *mutatis mutandis*, in all parts of the body, under normal conditions. For not only do the fluids penetrating and surrounding the tissues prove capable of exerting a certain pressure or tension upon measuring instruments, but the tissues themselves all exert a tension by virtue of their natural elasticity. The author has studied this subject by means of numerous experiments, and although the figures are often small, they are not to be overlooked.

The walls of the capillaries, then, themselves unable to withstand the whole amount of the intra-vascular pressure, transfer a part of it to the surrounding intercellular fluid media and enveloping tissues, which latter are able to support the pressure by virtue of their elastic properties. For all living tissue is possessed with a very complete though not a very great elasticity; that is to say, the molecules return *exactly* to their place after having been moved apart by an application of moderate force, but they cannot return at all when a great amount of force is applied. In fact these elastic envelopes of the capillaries play the same part in turning the intermittent pump-action of the heart into the continuous movement of the capillary blood-stream, as the elastic tunic of the great arteries does with their contents.

The tissues, then, being elastic, press upon the walls of the capillaries with a pressure of about two-thirds of the intra-vascular pressure of these same capillaries—quite a considerable force.

If, now, these tissues, endowed with such elastic properties, become in any way impaired, it necessarily follows that, their function being thus damaged, changes must naturally and inevitably take place in the circulation. And as we have seen, that inflammation does impair the tissues themselves, this theory quite naturally explains how inflammation can affect the circulation, and thus bridges over the gap found in other systems.

It now only remains to show in what manner energies exciting inflammatory action can influence the elasticity of the tissues. They do

so, by impairing their elasticity: the tissues are rendered inelastic, they are easily stretched and put out of shape: they are relaxed.

Thus we find the walls of inflammatory abscesses, which we have opened, shrivel up in folds; a sign that their elasticity is impaired. Special measurements of portions of excised tissue proved their elasticity diminished after they had been treated in a manner to excite inflammation by heat, chemical or bacteriological action; the author, indeed, found that inflamed tissue was comparatively very highly susceptible to tension by minute forces.

As soon as the elasticity of the tissues is diminished, the capillaries become dilated through the intra-vascular pressure, the current is accelerated, and what is called inflammatory hyperæmia obtains. At the same time the formation of lymph is increased, because the pressure within the capillaries is now greater than without. Relaxation of the tissues, however, also causes a slowing of the blood-current, as the elastic energy which before helped to impel the fluid through the capillaries, assisting the pumping action of the heart, is now missing. In this way the secondary slowing of the stream in inflamed districts is explained; especially when we consider that the amount of blood to be moved forward in the dilated capillaries is greatly increased—to as much as sixteen times the normal quantity—by the dilatation. These conditions also throw light on the efficacy of applying leeches to parts undergoing inflammation.

The present theory does not necessarily conflict with the views of Cohnheim's followers, who make chemical action affecting the vessels and tissues the prevalent means of inflammation, but it simply gives more prominence than has been hitherto done to the purely physical conduct of the parts, without touching on chemical alterations.

Œdema, which has been shown to arise from an impaired firmness and elasticity of the tissues,<sup>1</sup> differs from inflammation only in so far as

<sup>1</sup> In a treatise published by the same author, entitled: "Ueber die Gewebsspannung," (Leipzig, F. C. W. Vogel, 1884) which contains many points bearing upon the present theory, the following mention is made of experiments in proof of this statement:

If we make subcutaneous injections with warm wax or celloidine in healthy subjects, and subsequently, when the substance has hardened, make sections through the tumor thus obtained, we can observe that the spaces between the elements of the tis-

the filaments of tissue (as can be shown under the microscope) are simply hyperextended or relaxed, whereas in inflammation the tissues are much more radically affected in their structure.

Arterial or congestive hyperæmia differs from simple inflammatory hyperæmia in that it proceeds from a paralysis of the smaller afferent vessels without the elasticity of the tissues being, at first, impaired. The energy of the current being thus increased, the current becomes accelerated while the lymph formation is not materially increased—both of which phenomena are in exact opposition to those in inflammatory hyperæmia, where the elasticity of the tissues is diminished, but the energy of the blood-current remains unaltered.

Such hyperæmiæ of a purely arterial nature are, however, of rare occurrence in man, but they may be observed after section of the nerves, in neuralgic affections, and in other nervous phenomena, as in blushing.

On the other hand, the author would have hyperæmia occurring after an application of warm water (of 40° C.) considered as identical in origin with the inflammation ensuing after more intense actions of heat.

E. H. Weber has shown that muscles in action are more easily extended than those in a state of rest; the author therefore concludes that hyperæmia in exerted muscles is, in great part, due to the diminished resistance of the tissues to the blood-supply; and furthermore, that, as organs are impaired in their constitution and damaged by the very exercise of their function, the hyperæmia induced by such damage, affecting their elastic properties as well, does not qualitatively differ from what is generally called reparative inflammation.

Inflammation, in fact, far from being an enemy to the organization of the body, is essential to its health; it is a weapon with which the body combats destructive influences in healthy parts. The heightened afflux of blood to inflamed parts and their copious permeation, we might say irrigation, with lymph-fluid, serve to cleanse the tissues of

sues are all distended and filled with the substance injected—just as they are pathologically distended by air in subcutaneous emphysema or with pus in phlegmone. And under the microscope these sections present *regular rhomboid figures*. If, however, we in the same manner inject parts affected with *edema* and examine the preparation in the same way, the interstices will not, as before, present rhomboid figures but they will appear *perfectly round* in every section, thus representing balls.



deleterious substances and to convey elements of reconstruction to where they may be needed.

Turning from theory to practice, the author believes it imprudent to combat inflammation, which is, in reality, a reparatory process; or, at least, it is futile. For traumatic inflammation he favors warmth and moist applications. Ice is only of value in producing local anæsthesia in fractures, etc., but retards the healing process. In conclusion, the author adds several interesting and ingenious hypotheses in support of his theories.

As to the emigration of white blood-corpuscles observed in inflammation, the author considers this phenomenon capable of being brought into connection with his theory of regarding inflammation as a reparatory process, and appears inclined to believe, in keeping with the most recent observations, that the leucocytes emigrate of their own accord and battle with infective agents.

As to the differentiation of various inflammatory processes and their classification as serous, purulent, croupous, cheesy, and other species of inflammation, he inclines to the idea, now fast gaining ground, that each separate type of inflammation is due to distinct exciting causes, each one calling forth its own peculiar form of specific inflammation.

The fact that inflammation occasioned by bacteria should produce suppuration instead of some other form of inflammation, the author believes to be analogous to the liquefaction of the gelatine in cultures; perhaps the production of peptone can account for the failing coagulation. Thus tubercle-bacilli do not liquefy the media of cultivation, and in the body they form cheesy abscesses.

That leucocytes should be so sparingly found in traumatic inflammation the author attributes to the high tension existing in the tissues due to the numerous smaller hæmorrhages.

W. VAN ARSDALI

## THE PRESENT STATUS OF THE OPERATION OF EXTIRPATION OF THE UTERUS FOR MALIGNANT DISEASE.

In approaching this debatable ground the writer would disclaim at the outset the ambition of adding anything new to the already extensive literature of the subject. It is his intention to examine it in an impartial manner, with the view of gathering up the various floating opinions with regard to it, and of deducing from them a concise summary. It is desirable that an operation which has been regarded with favor by many general surgeons should not be viewed entirely from the standpoint of the gynæcologist. It may be safely assumed that in a question both sides of which have been argued so ably and convincingly there is some middle ground which may be taken without doing violence to either facts or theories. While it is impossible to present a complete series of statistics up to date, a sufficient number of operations have been carefully recorded, at least by foreign surgeons, to allow of certain positive deductions.

The surgical reader may be spared all unnecessary details concerning the pathology and course of malignant disease of the uterus, the objects aimed at in the operation and the *technique* of the same. The only point to be decided is how far that object is attained, and, therefore, how far the measure is a justifiable one.

In referring to extirpation of the uterus it is intended to include complete removal of the organ, either by laparotomy or through the vagina.

In reviewing the current opinions on this important subject, the writer has been convinced that the best way of arriving at a clear idea of the tendency of modern gynæcology is not to collect reports of isolated cases or to review elaborate statistics, which at the best are misleading, but to study the society proceedings, since these represent the decided and unbiased opinions of the most distinguished surgeons. The proceedings of such bodies as the American Gynæcological and

London Obstetrical Societies, the Académie de Médecine and the societies of Germany and Italy, not to speak of the discussions of the late International Congress, will afford a clearer view of the subject than can be gained in any other way. There is no readier method of gathering up the invaluable results of the world's thought and, by generalizing from these, of arriving at some definite opinion. Pursuing this principle we shall make but few allusions, except in a general way, to this voluminous bibliography. For exhaustive references we refer to Hegar and Kaltenbach, *Am. Jour. of Obstetrics* (Munde's and Jackson's articles). An article by Currier (*N. Y. Med. Jour.*, Vol. 31, 1881) gives a good idea of the history of the subject and its status up to 1881. The modern text-books on gynecology, especially Martin in German, abound in valuable references and statistics.

Reference to the Index Medicus and to current literature will furnish numerous reports of isolated cases of hysterectomy, many of which contain important references. To mention these is sufficient; but as our study is to make a generalization and not to dwell upon details that are already familiar, we shall have little to do with isolated cases.

Freund's operation may be dismissed in a few words. There is very little difference of opinion at the present time with regard to the advisability of this procedure. Two years ago its scope was considered as very limited, and now few surgeons would think of performing it, except in those rare cases of sarcoma or carcinoma, where the disease is strictly confined to the corpus uteri.<sup>1</sup> In this country Freund's operation is now as rare as resection of the pylorus—and quite as fatal in its results.

Vaginal extirpation of the uterus is an operation of considerable antiquity,<sup>2</sup> and the fact that nearly three hundred cases are on record, with a mortality of less than 28 %, <sup>3</sup> raises it above the level of a surgical experiment. There must be something in it or it would not have so many enthusiastic advocates. The fact that the operation

<sup>1</sup> For a concise summary of the current views on Freund's operation, the reader may refer to a short article by Prof. W. M. Polk, in the *New York Med. Journal*, August 25, 1883.

<sup>2</sup> See *Annals de Gynecologie et d'Obstetrique*, Sept., 1885.

<sup>3</sup> See an article by Dr. N. B. Carson in the *St. Louis Courier et Medicine* for 1885. This is the most recent contribution on the subject.

meets with general favor in Germany is quite natural. German surgeons have revived and perfected it, have made decided improvements in the *technique*, and moreover, have had a sufficient number of cases to acquire skill in its performance. No single French, English or American physician can refer to a series of cases sufficiently large to justify him in generalizing from the results of his own experience. Under the circumstances, the best that we can do is to collect the opinions of the many as well as the results of the few. Schroeder's views are generally known:<sup>1</sup> he has not altered them since they were first expressed before the British Medical Association. The opinions of his contemporaries may be found in the proceedings of the "Naturforscherversammlung,"<sup>2</sup> where such men as Olshausen, Martin, Singer and Veit declare themselves in favor of it, in spite of the unfavorable statistics which they present.

The French are more cautious in their adoption of the operation. Perhaps its German origin may account for this hesitation. At a discussion before the Paris Academy of Surgery last year most of the surgeons present concurred with Verneuil and Polaillon in saying that vaginal hysterectomy would be a good operation if it was less dangerous, and that it would be less dangerous as surgery improved. It was, according to the opinion of the meeting, "the operation for the future;" with the present rate of mortality no surgeon could conscientiously resort to it. In Italy their results have not inspired surgeons with much enthusiasm. Out of twenty cases reported by Novaro,<sup>3</sup> ten died from the direct effects of the operation, and in eight there was an early recurrence of the disease. An English editor, commenting on these statistics, adds that "they bear out Koeberle's dictum that those who recover have no cancer and do not need the operation—those who have cancer do not recover." English gynecologists are almost unanimous in their condemnation of the operation, preferring, with a few exceptions, the method of supra-vaginal excision. The opposition to Schroeder's views expressed by Mr. Thornton at the meeting of the British Medical association in 1883 is still endorsed by his countrymen.

<sup>1</sup>*Brit. Med. Jour.*, Vol. II, 1883, p. 519.

<sup>2</sup>*Archiv. für Gyn.* Bd. XX. Hft. 2.

<sup>3</sup>*Ann. di Obstetricia, Gynecologia et Pediatria*, Oct., 1884.

<sup>4</sup>See *Brit. Med. Jour.*, Vol. II, 1883, *loc. cit.*

The views of American surgeons are fairly represented by Dr. A. Reeves Jackson<sup>1</sup> and Dr. P. F. Munde,<sup>2</sup> whose controversy on this question has done not a little to awaken a general interest in it among the profession. Their papers, together with a more recent one by Jackson, are judiciously summarized by Grandin,<sup>3</sup> who decides, after a review of all the evidence now published, that there is a "justifiable field for the operation, however narrow."

The latest contribution on the subject from an American surgeon is the report of a successful case by Dr. Carson, of St. Louis,<sup>4</sup> to which is appended a concise statement of the current views regarding the justifiability of the operation, and his own opinions as to its limits. Since these represent the views of the majority of gynæcologists, both American and foreign, we shall be pardoned for quoting them.

"I am led," he writes, "to conclude, from a careful study of the subject, that the operation is justifiable in the following cases, if the patient desires it after all the dangers have been fully explained, as also the possibilities of imperfect removal and almost immediate return of the disease :

"First, when the disease invades the body of the organ and it is freely movable, and no signs of the disease can be detected in the surrounding tissue.

"Second, in cases of cancer of the cervix, extending up so as to render the removal by less radical means impossible.

"Third, when the body is not too large to be removed through the vagina.

"Fourth, when the vagina is sufficiently large to admit of the proper manipulation.

"Fifth, when there exists no constitutional disease, as tubercle, Bright's disease, etc.

"Sixth, it should not be undertaken, except for malignant disease, and when the diseased tissue can not be fully eradicated by other and less radical means."

<sup>1</sup> Trans. Am. Gyn. Soc., Vol. VIII, 1883.

<sup>2</sup> Id., Vol. IX, 1884.

<sup>3</sup> Review of Trans. of Am. Gyn. Soc. for 1884, in *Am. Jour. of Obstetrics*, July, 1885.

<sup>4</sup> St. Louis *Courier of Médecine*, October, 1885.

Now, a review of these limitations, as they are thus candidly stated, will make it evident that the scope of the operation, even as granted by its supporters, is small, and that certain of these obstacles are inseparable, even with the advance in technical skill which Dr. Mundé prophesies. But, granting that the operation is not extraordinarily difficult in skilled hands, still is there any reason for performing it? Dr. Jackson replies strongly in the negative, and he represents a formidable opposition party, which includes some of the foremost gynæcologists in England. His objections are briefly as follows: 1. The early diagnosis of cancer is doubtful, or impossible. 2. The operation is very dangerous. 3. It does not cure, and relieves suffering only by terminating the patient's life. This has been stated in a more accurate and less dogmatic way by others. The anatomical argument is hardest to overcome, since it rests upon a basis of actual observation. The best diagnosticians have been very often mistaken in their judgment as to the strict limitation of the disease to the uterus. Even Schroeder, with his wide experience and careful methods of examination, records several cases in which he had erred regarding the condition of the peritoneal tissues. The grosser results of the extension of the disease, fixation of the uterus, enlargement of lymphatic glands, etc., could not escape a gynæcologist of ordinary skill, but the enormous lymphatic supply of the pelvis is such that the disease might be widely disseminated before any suspicion of the fact was awakened.

As regards a radical cure by vaginal hysterectomy, Dr. Munde has certainly shown most conclusively that "39.2 per cent of the cases in which the operation was performed at a sufficiently early period to permit the incisions to be carried through still healthy parametrium, remained free from recurrence two years after the operation." "As compared," he adds, "with the results reported by Pawlik, of 25 per cent after removal of the cancerous cervix only, and of Schroeder of 21.8 per cent, after different methods of operation, this percentage can certainly not be considered unfavorable." But, in spite of this specious argument, the fact remains that the operation is a *palliative* measure, and the question still recurs, is it wise to take such risks in order to secure temporary alleviation? It is in vain to bring forward statistics, even if they are supported by such an able writer as Dr. Mundé. A

certain number of surgeons in every country are still conservative (or merciful?) enough to shrink from the radical measure, preferring the milder course of supra-vaginal excision. The latter alternative is the one which has been recommended by most of the English specialists and by not a few of the American. In New York vaginal hysterectomy is not in special favor among gynæcologists, judging by the opinions of the Fellows of the Obstetrical Society. To tell the truth, the general surgeons have been more successful with the operation (just as they have no mean record in ovariectomy), in spite of the criticism of Mr. Tait that the anxiety of our general surgeons to meddle with the pelvic organs is productive of harm. Dr. Thomas, who certainly performs more operations than any other American gynæcologist, after giving hysterectomy a fair trial, has abandoned it in favor of supra-vaginal excision. He practices a modification of Schröder's operation, and thus far with success as regards both safety and permanent relief to the patient.

I am unable to give his exact statistics, but I know that he has had no deaths (in nearly twenty operations) and a very small percentage of recurrence. The operation as performed by him is often practically an extirpation, since he removes the diseased tissue so thoroughly that barely the shell, as it were, of the uterine body remains.

Dr. Mundé's statistics regarding the direct mortality from the operation are highly encouraging. He rightly says: "Except in the hands of specially dexterous or fortunate operators, ovariectomy, even at the present day, presents quite as high a mortality rate, when all the operations by different operators, skilled and novices, are included." There is a good deal of truth in this statement, however positive it may be, at least as regards American statistics, Laparo-hysterectomy for uterine fibroids carries with it a heavy mortality in this country, yet it is universally supported. It may be justly said of this formidable operation, as Dr. Jackson says of vaginal hysterectomy, that in performing it "we stake what we do not own—the life of a patient—against the heaviest of odds." Lumbar colotomy for cancerous strictures, is purely a palliative measure, 10 per cent of the patients die from the effects of the operation,<sup>1</sup> and the disease is in no wise checked. Yet this operation needs no defenders; in fact it finds its warmest adherents

<sup>1</sup> Keetley—Index of Surgery.

among the most conservative English surgeons—the same ones who condemn so unhesitatingly the removal of the cancerous uterus.

From this hasty review of the subject, in which the writer has refrained from expressing opinions which have already been so much better stated than he could give them, it is evident that it is still in a very unsettled condition. It will be at once apparent to the thoughtful reader that on the side of the operation is arrayed the younger and more progressive element, while in general the older and more conservative surgeons head the opposition. Moreover, those who condemn the operation do so in unmeasured terms, for them there is no middle ground. The carefully guarded statements of Dr. Mundé, representing fairly the views of the other side, are not the expressions of reckless surgery. Men are not performing operations for the mere sake of doing them, and it is unjust to confound boldness, tempered by conscience, with recklessness.

It is not possible to decide this question at present. It can only be said, from the evidence now before us, that vaginal hysterectomy has not been cried down, in spite of the bitter attacks which have been made upon it. It remains to be seen whether, "when properly restricted," it is to have a "brilliant and permanent future."

The writer's experience with the operation has been limited to the observation of four Freund's operations and three cases of vaginal extirpation. Two of the former could not be completed, and *all* resulted fatally, although they were performed by experienced operators. In four of the cases, in which the writer made a careful examination of the specimens the disease was found to be *strictly limited to the cervix*, so that supra-vaginal excision would have answered every indication. Moreover, there were no evidences of parametritic deposits. And yet the operators were accomplished diagnosticians! One case was interesting, because it proved the treacherous nature of uterine sarcoma. The lymphatics and pelvic tissues were absolutely intact, while the mucous membrane of the small intestine was studded with metastatic deposits. And yet some writers affirm that sarcoma of the uterus is *the* indication for vaginal extirpation!

Certainly the scope of the operation is a limited one. None but the experienced have any right to attempt it, for, to tell the truth, it is the



reporters of isolated cases (most of them fatal) who have done the most to discredit it. We are sure that we only reflect the opinion of fair-minded men when we say that if vaginal hysterectomy is to obtain a foot-hold, it must become for a time a little less fashionable. Let it be confined to a few skillful, conscientious surgeons and then we shall be able to arrive at something like a fair estimate of its value. It is not an operation for the general practitioner. There should be a division of labor in this department, as well as in that of abdominal surgery.

H. C. COE.

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#### ON THE USE OF INJECTIONS OF AN ETHEREAL SOLUTION OF IODOFORM IN THE TREATMENT OF COLD ABSCESES.

At the late session of the French Congress of Surgery, Professor Verneuil, of Paris, enthusiastically recommended the use of iodoform dissolved in ether as an injection into the cavities of cold abscesses. In the *Revue de Chirurgie* for May, 1885, he gives full details of his method of procedure, with a brief statement of the theoretical ideas upon which the treatment is based. He calls attention first to the fact that it is not so much the fluid contained in these abscesses as it is the abscess-wall in dealing with which therapeutic measures are called for. This wall he would divide into two layers: an external, of irritative origin, but without specific character, and which, with the subsidence of irritation, quickly contracts and spontaneously disappears; an internal, in which is concealed the cause of the disease, the parasitic tuberculous germ.

This internal layer, or parietal tuberculous dépôt is then the part which, if a cold abscess is to be cured, must be destroyed in some way, rapidly or slowly, by operative or therapeutic measures. Rapid destruction by operative measures, Verneuil considers to be inconvenient and dangerous, while often unreliable and sometimes impossible. Iodoform, however, he believes to be a parasiticide whose power to destroy tubercular matter is well demonstrated, so that it presents itself as a therapeutic agent, benign, efficient and of easy application.

It is true, however, that this agent is toxic in certain doses and conditions, so that it is necessary to seek for those proportions in which it might be introduced into an abscess cavity, and be efficient in destroying the virulence of the internal layer without producing toxic phenomena. It is to be considered also, whether if, in place of using a strong, and consequently somewhat dangerous solution, success might not be obtained as well by the use of weak and harmless solutions on condition that they are left in prolonged contact with the parasite.

For carrying with certainty into the most distant parts, and into every minor irregularity of cavities of such varying extent and irregularity as those of cold abscesses, a vehicle is needed particularly diffusible. For such a purpose ether seems better adapted than any other liquid, while, in addition, it possesses the advantages of cheapness, is devoid of toxic properties, and is everywhere attainable. When an injection of an ethereal solution is made, the ether is vaporized and quickly absorbed and the iodoform is deposited as an impalpable powder in a uniform layer upon the whole extent of the abscess wall.

The method of use, as advised by the author, is to first evacuate the abscess by aspiration. He makes use of a large sized trocar, uses as little manipulation as possible, stops as soon as the liquid is a little blood-stained, abstains from any washing out of the cavity, and proceeds at once to make the injection with the iodoformized ether. He uses a five per cent solution, and injects at the maximum not more than 100 grammes, generally 50 or 60 grammes suffices. Thus the amount of iodoform left to be absorbed never exceeds 4 or 5 grammes. The absorption both of the ether and of the iodoform seems to be effected very slowly. Scarcely has the injection reached the cavity before it swells up and regains dimensions equal to, if not greater than it had before the operation. Percussion shows this to be due to the sudden vaporization of the ether. The sonority persists several days, sometimes for quite a week. Gradually a regained flatness shows that the ether vapor has disappeared.

However large the quantity of ether injected, Verneuil has never seen any exciting, amesthetic or narcotic effect referable to rapid entrance of the ether into the circulation.

The prolonged persistence of the iodoform in the suppurative focus

is not less certain. Appreciable traces of it have been found even at the end of five months. Should we have to deal with an immense abscess, such as those that extend from the thorax to the middle of the thigh, the sac might be at first emptied by a simple puncture and the iodoform injected later, when it may have become partly refilled. Moreover, the risks of poisoning would certainly be escaped, if, as everything indicates, the prolonged action of the medicament produces the same effects as its great concentration: if, that is to say, the tuberculous matter can be neutralized as well by leaving in contact with it small quantities of iodoform, as by destroying it outright with large quantities. In the use of weak solutions, several repetitions of the injection may be necessary. According to V.'s experience a cure may be expected after from two to four injections on an average, when the cavities are large and the solution is a weak one. Such repeated applications do not prolong the duration of the treatment much more than the more bloody methods of operating. In their favor, also, is the fact that within a few days after this minor operation, a patient can resume his occupation.

One may avoid also the two dangers, of too strong doses on the one hand and of too weak on the other. In abscesses of small dimensions, as for example not to exceed the volume of a large orange, a strong solution could be injected, as for instance 20 grammes of ether, charged with 4 grammes of iodoform—a 20 per cent solution. By leaving these 4 grammes of iodoform in such a cavity the immediate destruction of the parasite, and in consequence a rapid cure could be expected.

In deep and capacious abscesses, repeated injections must be made; but, in order not to prolong indefinitely the treatment, it would be well to know what intervals ought to occur between the successive injections. This has not yet been definitely settled, although, *a priori*, it seems useless to renew the supply of the parasiticide as long as it is not exhausted; this would plead for rare s<sup>e</sup>ances. On the other hand, as soon as the pus has lost its specific character, it would be an advantage to extract it rather than to leave to nature this task, always prolonged, of absorbing it. This would suggest the emptying of the sac as soon as the destructive mission of the iodoform has been accom-

plished. The author appreciates the difficulty of arriving at any exact determination of the time when either the iodoform is all absorbed, or the abscess has lost its specific character. He suggests no way of getting over this difficulty, but proceeds to say that the intervals at which the injection shall be repeated may be left to the discretion of the surgeon. The operation is so devoid of danger, and so simple that it might be repeated every month, on an average, without inconvenience.

Professor Verneuil, in conclusion, apologizes for giving so much prominence to so simple a therapeutic procedure. One of the chief motives which has actuated him, he says, is his desire to protest against a tendency to bloody surgery which he believes to exist at the present time. Every one can treat a cold abscess by iodoformized injections. There is required only a syringe, a solution, and a degree of skill not exceeding that needed for the common operation for hydrocele. The author believes the method to possess the three requisites of efficiency, safety, facility.

L. S. PILCHER

## INDEX OF SURGICAL PROGRESS.

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### General Surgery.

I. THE ORIGIN AND CAUSATION OF SUPPURATION BY CHEMICAL IRRITANTS. By Dr. E. SCHIEUERLEN (Berlin). Three investigators, Uskoff, Orthmann and Councilman (1881, 1882 and 1883, respectively), had previously attempted to determine whether chemical irritants or only micro-organisms could cause suppuration. They all obtained affirmative results. The methods of the first two are, however, decidedly open to criticism and that of Councilman is not quite proof. The general method of the latter further perfected was employed by S., under direction of Dr. Fehleisen and Prof. von Bergmann. S. took common fusiform lymph tubules of glass, which suck up the experimental fluid by capillarity and can be easily sealed by melting their ends. In the first of two series of experiments he used those holding nearly or quite a drop (2 to 4 cm. long, 2 mm. across at middle point); in the second those holding about 4 drops (3 to 5 cm. x 3 mm.). These prepared tubules were then exposed in Koch's apparatus to a current of steam of 100° C. for half an hour.

The following substances were tried: Oleum terebinth, ol. crotonis (1:5 ol. olivar.), ol. sinapis (1:5), ol. cantharid, ol. carophyll., ol. macidis, ol. sabinæ, ol. cajeputi, ol. juniperi, tartar. stibiat. (1:3 aq. destil.), inf. rad. ipecac (5:50), decoct. fruct. caps. (5:50) and acid. formic. Sterilized water was used for control experiments.

S. introduced the little spindles by means of a hypodermic-like needle 10 cm. long, with a rod (follower) in its interior, adjustable by a screw. This tube was 3 mm. in diameter in the first series and 4 mm. in the second. In this way the little spindles could be passed well under the skin with the smallest possible wound. Only rabbits were experimented with—32 in all. As a disinfectant  $\frac{1}{10}$  % sublimate solution. He always punctured between vertebral column and crista ilei. A spot slightly larger than a half-dollar piece was clipped and thoroughly washed with the sublimate; this he considers preferable to the apparently more thorough methods of producing eczema. The needle, spindle, etc., are laid in the sublimate; a current of the disinfectant plays on the spot to be punctured; this is raised and the tube introduced, when the spindle is pushed out at the point desired.

The slight wound did not need suturing but was covered thick with iodoform colloidum, especially to prevent the animal licking it.

The subsequent course was in general as follows: The tubule lay without any reaction beneath the skin. After 8 or usually 10 to 14 days it was smashed—the ex-

ternal wound having entirely healed. A day or two later a slight swelling appeared at the point where the spindle was broken, increased to the fourth day, remained stationary until about the twelfth, and then slowly diminished. The lump felt hard, but was freely moveable in the loose tissue; fragments of the glass could not be felt. The rabbits were killed four to eight days after smashing the tubule. The circumscribed lump had on section a yellowish white color, separated by a sharp contour from the bluish-white subcutaneous tissue, and resembled a lump of fat, though less yellow, and presenting a smooth surface. Muscle and skin were not affected.

The size of the tumors varied in the first series from 3 to 4 cm. in length,  $1\frac{1}{2}$  to 2 cm. in breadth and  $1\frac{1}{2}$  cm. about in thickness; in the second series from 5 to 6 cm. in length, 3 to 4 in breadth and about 1 cm. in thickness. Ipecac-infusion, pepper-decoction, tartar emetic, oil of cantharides and formic acid were the least active, the others nearly equal.

In Councilman's experiments pus was found where here there was an organized firm tissue. Pressure here brought clear lymphatic fluid to the cut surface—no pus. Fragments of the tubules—where the latter were not entirely crushed—contained the same clear fluid and even young fibrous connective tissue.

Microscopic examination of the capsule from preparations hardened in alcohol showed, when colored with methyl-violet or Löffler's alkaline methyl solution, a cellular infiltrated connective tissue more charged with cells towards the inner surface adjoining the tubule; these at some points almost hid the intercellular substance. Bacteria were never found. In nine cases immediate cultures were tried with negative results.

Not only the macroscopic and microscopic examination showed that the substance was not pus but also the fact that it could be hardened in alcohol and cut. Moreover, in the only case where the animal was allowed to live 24 days, the entire inflammatory growth disappeared; a thin fibrous layer, in color not distinguishable from the other subcutaneous tissue, surrounded the remains of glass. Two experiments with sterilized water produced no swelling; only a rather thin veil-like capsule of connective tissue was found.

In one case only did he get pus—and here a thin cord reached to the point of puncture which had not healed; here a few micrococci were found.

He concludes that chemical irritants in quantities such as here used are only able to produce inflammation, never suppuration.—*Arch. f. klin. Chirg.* 1885. Vol. 32. Hft. II.

II. ON THE DISINFECTING ACTION OF AQUEOUS SOLUTIONS OF CARBOLIC ACID. By DR. GARTNER and FLAGGE. An investigation of the effect of 1, 2 and 3 % carbolic acid and  $\frac{1}{10}$  % sublimate solutions on the micro-organisms of pus, osteomyelitis, meningitis, glanders, splenic fever, typhoid, etc., to determine strength of solution and length of exposure to the same necessary to kill the said germs. The method consisted of pure cultures in glass bulbs containing sterilized bouillon for 1 to 3 days; then shaking 1 cm. of this with 49 cm. of a 1, 2 or 3 % carbolic or

$\frac{1}{10}$  % sublimate solution; removal of a drop at the end of 8 seconds to 5 minutes and cultivation of this in gelatine. The amount resp. absence of colonies developing in this showed the success of the disinfection. The results are presented in a table. The organisms from a non-traumatic meningitis proved most resistant, some of these withstood  $\frac{1}{10}$  % of sublimate for 1 minute, and both these and the osteomyelitis cocci withstood short contact with 2 % carbolic. On the other hand every form was killed by 3 % carbolic for 8 seconds.

Hair taken from a Guinea pig's back—which had been well rubbed with micrococcus prodigiosus and then disinfected with 3 % carbolic—produced in one case no colonies and in another but 2.

Scalpels, silk, etc., were also examined. Well washed towels were found comparatively free from germs,

They conclude that 3 % carbolic suffices to rapidly destroy the various micro-organisms which as yet chiefly interest the surgeon—provided it is possible to bring them quickly into contact.—*Arch. f. klin. Chirg.* 1885. Bd 32. Hft. II.

III. OBSERVATIONS AND INVESTIGATIONS ON TRAUMATIC TETANUS. By Dr. P. GUETERBOCK (Berlin). 2. On Traumatic Tetanus from Local Freezing. G.'s previous article (same Archives, vol. 30) was on tetanus hydrophobicus. In the present he has collected sixteen cases (one in an appendix) of tetanus following local congelation; these include two new ones, while certain others from their indefiniteness are not reckoned. But one of these cases was a female.

The English Crimean war report gives two cases, a German corps in 1870-'71 gives one, the Prussian army of 1877-'78 gives two and our rebellion one, while French soldiers seem to be slightly more disposed. Although this form is very rare, still in the first three of these war reports it amounted to nearly  $\frac{1}{4}$  % of all cases of tetanus (5 in 115).

Most of these patients were under poor hygienic conditions and the freezing, with perhaps one exception, was very severe. The lower extremities were in all the cases the seat of the principal primary trouble. In two cases the parts had been amputated and hence questionable if they belong here. The complication set in from four to eighteen days after freezing. No prodromata. Course acute. Some fever. One recovery.—*Arch. f. klin. Chirg.* 1885. Vol. 32. Hft. I.

W. BROWNING (Brooklyn).

IV. THE PREDISPOSING CAUSES OF ANEURYSM. A STATISTICAL INQUIRY. By JOHN B. HAMILTON, M.D. (U. S. Marine Hosp. Ser.). By a study of statistics obtained from inebriate asylums, health reports, the provost marshal general's bureau, glass workers and other workmen and the fire-rooms of steam vessels, where a continuous high temperature is found, Surgeon-General Hamilton concludes that the only constant element among the alleged causes of aneurysm is climate; that neither syphilis, alcoholism, occupation nor heat alone appear to have an appreciable influence on the causation of the disease. The question of the influence of diet he leaves open.

V. COMPARATIVE RESULTS OF OPERATIONS IN BELLEVUE HOSPITAL. By STEPHEN SMITH, M.D., (New York). Formerly everything was subordinated to celerity in operation; now mere haste is mentioned but to be condemned; recovery without suppuration is the end sought; perfect cleanliness and thorough antisepsis of operation, assistants, patient, instruments and dressings is required, by the use of (1) soap and water to external parts, (2) carbolic solution for all instruments, (3) bichloride solution for all surfaces and tissues and (4) iodoform for external dressings—all this in contrast with the disregard for cleanliness formerly in vogue. Sponges are elaborately purified; the ligature is aseptic and not expected to “come away,” drainage tubes used but as a temporary expedient, if at all, no suppuration being expected, and the lips of a wound being brought by deep and superficial sutures into complete apposition; in contrast with former careless methods of applying dressings the present method is careful in the extreme, consisting of a dusting with iodoform, layers of disinfected material with iodoform between the layers, the whole being retained by bandages of disinfected materials carefully preserved in a disinfected atmosphere. The results obtained are as much in contrast as are the procedures: Compound fractures, which under the old fracture-box or gypsum-splint treatment always suppurated, resulting often in loss of life or limb, are almost uniformly cured without any drawback by (1) removing from the wound every particle of matter liable to injure the tissues and induce suppuration; (2) placing in fixed apposition all the tissues composing the wound; (3) cleansing and disinfecting the wound and protecting it from becoming soiled during recovery; (4) protecting the wound by immoveable dressings from any movement of the parts entering into it while the process of repair is going on. Amputations, the wounds from which rarely, if ever, recovered, except after long continued suppuration, the larger ones being terribly fatal, are now among the most successful operations. Excision of the larger joints, which was formerly a most doubtful and dangerous operation, involving suppuration and confinement for months, as a rule now do not suppurate, union taking place by rapid and healthy granulation. The danger of secondary hæmorrhage after ligature of large arteries has passed away now that the artery need no longer be divided by the ligature, but is strengthened by a non-irritating and preferably absorbable ligature; no suppuration occurring, the artery enlarges externally at the seat of the operation, while the coagulum organizes internally and closes its calibre. Cold abscesses, not connected with bone, were preferably allowed to open themselves, or, if touched at all, opened by a “valvular” incision and the pus allowed to flow out at several sittings; now they are cured promptly, without suppuration, by opening freely and, with the curette, scraping out all old granulations and diseased tissues, cleansing the cavity with bichloride solutions, and pressing the walls together with disinfected dressings; abscesses connected with bone are freely opened and thoroughly cleansed with bichloride solutions, which secures rapid recovery. Fractures of the patella, formerly the surgeon’s *bête noire*, are invariably cured by wiring the fragments, with antiseptic precautions. The same change is observable in the gynecological surgery



of the institution. All these improvements are secured in spite of the fact that the hospital is an old shell, containing in its walls and its environments all the conditions that in modern times are regarded as unhealthful and unsanitary and can be attributed only to the superiority of the methods now employed over those formerly in vogue.

## Operative Surgery.

I. THE RADICAL CURE OF HERNIA AND HÆMORRHOIDS BY ELECTROLYSIS. By J. CRAFT, M.D. (Cleveland, O.). Dr. Robert Newman, of New York, reports, in a paper read before the Fifth District Branch of the New York State Medical Association, the application of electrolysis to the radical cure of hernia and hæmorrhoids by Dr. Craft. The hernia is first reduced and held in place by the index finger passed into or through the external ring, if possible, the cord and the sac, if it remain in the ring, being kept pressed well to one side. The skin over the external ring is punctured with a bistoury and through this puncture is pushed a blunt-pointed needle electrode, insulated to within a quarter of an inch of the end, and attached to the positive pole of the battery, the electrode being carried well up between the rings by the side of the invaginated finger, which holds the cord and vessels from contact with it. The other electrodes may be held by the patient, with the hand of the side operated upon, or elsewhere, as may be desired. The circuit of about ten cells of a galvanic battery is then connected and the current continued for from six to ten minutes, the point of the electrode being changed from one side of the finger to the other, always keeping as clear of the cord as possible and directing the current away from it. Dr. Craft uses the positive pole because it is not as painful as the negative and, being the acid pole, he conceived that it would excite sufficient inflammation and at the same time coagulate the blood in the small vessels, creating a harder cicatricial inflammation than the negative or alkaline pole, which he considers to have the effect of softening the tissues and causing the absorption of already formed cicatricial tissue. There is no supuration resulting from this method, since no foreign matter is deposited for a nucleus as in case of treatment by injection. The patient should remain in bed for at least two weeks and then use a well fitting truss for a time, until the part becomes strong and firm. Dr. Craft reports success with three cases treated by this method. The same method has proved eminently successful in the treatment of hæmorrhoids.—*Med. News.* 1885. Oct. 24.

II. A MODIFICATION OF THE PROCEDURE OF WIRING BONES. By WM. F. FLUHRER, M.D., (New York.) Describes and illustrates a combined hook and drill, a two-pronged fork with the tips of the prongs notched, and a special form of retractor, to be used in wiring bones, with the application of the method to resection of the knee joint. The bone is drilled through and, by means of the fork, a silk loop is applied to the hook of the drill, which is then drawn back, carrying the silk with it through the bone. It is essential that the closed end of the loop should lie between the bones, on the opposite side from the external opening, and if a loop

needs to be reversed to obtain this, a second thread can be passed through the first loop, which is then drawn back. A piece of wire more than double the thickness of the bones in length, is provided, the ends hooked and caught into loops passing through corresponding channels in the two bones, and the loops drawn back, carrying the wire with them, which is then embedded in the bone and firmly twisted. By this method bones can be wired together with less disturbance of the soft parts and, the sutures passing entirely through both bones, they are more closely and firmly held together than by any other method, while the grating formed by the sutures prevents the intrusion of the soft parts.—*N. Y. Med. Record.* 1885, Sept. 26,

J. E. PILCHER (U. S. Army).

## Head and Neck.

I. ON THE MODERN INDICATIONS FOR TREPHINING, with especial references to hemorrhages occurring from the middle meningeal artery. By Dr. P. WIESMAN (Zürich). In this paper, 226 pages in length, and containing over 300 cases, many of which were observed at the Zürich surgical clinic (Prof. Krönlein) and are now published for the first time, the author presents a valuable contribution to the question of operative treatment of certain injuries of the head. About two-fifths of the whole work, with 278 cases, is devoted solely to the subject of the middle meningeal artery. Very little attention is given to the technical side of the subject; the author favors antiseptic treatment, the use of the trepan when the skull is intact, that of the chisel and hammer when it is fractured, and would have the integument closed over the opening with the help of sutures or a plastic operation.

After showing how the operation of trephining has become more frequent with our increased knowledge of the pathology of the brain and with improved antiseptic methods, he considers the indications for trephining as represented by the following conditions; 1. Compound fractures of the skull—energetic primary disinfection of the parts being the principal object here, as well as the removal of foreign bodies and fragments of bone, to secure favorable conditions of the wound; simple fissures communicating with a wound should only be opened up in case entrance of septic matter is suspected. 2. Compression of the brain inside the cranial cavity—with the purpose of removing the cause of compression, when it is accessible. 3. Diseases of the bones of the skull, such as necrosis or caries, syphilitic or tubercular disease—the object here being to remove infectious processes. 4. Tumors of the brain or its surroundings—an indication belonging to the present era. 5. Such maladies as epilepsy, headache, in certain cases.

The author speaks in favor of trephining for each of these affections, not, however, adducing anything of special note, beyond the cases, excepting under the second heading: *Compression of the brain* may result (1) from intra-cranial hæmorrhage, (2) from accumulation of pus between the skull and the dura mater or from abscess of the brain, (3) from depression of the skull and (4) from the presence of foreign bodies or fragments of bone, especially of the tabula interna. The treatment of compression should be operative whenever it is due to purulent accumulation or

brain abscess, to spicula of the tabula interna producing marked brain symptoms, or to foreign bodies, provided they be easily reached.

Trephining is contra-indicated in subcutaneous depressions of the skull, especially in children, and when a foreign body has penetrated the brain in such a manner that its removal would necessitate searching for it in the brain substance. In cases, however, where death is imminent from extravasations due to crushing of brain-matter, the author believes an attempt to save the patient's life by trephining justified.

As to the treatment of hæmorrhages situated between the dura and the skull, trephining is indicated as soon as marked symptoms of pressure are developed, and the situation can be ascertained with some certainty.

Rupture of the *middle meningeal artery* here absorbs the main interest, other hæmorrhages receiving only cursory notice, and the cases given are specially classified and tabulated. After an anatomical survey of the course and the topographical relations of this artery, the author enumerates the causes of injury as follows. Direct wounding of the vessel by sharp instruments; laceration by projectiles or fragments of bone; rupture by changes in the relative position of the surrounding bones (the most frequent cause); rupture without fracture of bones in consequence of differing elasticity in the tissues, occurring especially on the side opposite the injury.

Rupture having taken place, commotion of the brain prevents the flow of blood; but sooner or later hæmorrhage occurs and severs the dura (unless injured) from the skull. The clot may become putrid even when not exposed to the air.

The *symptoms* pointing to rupture of the middle meningeal artery are given as follows: (1.) Interval of consciousness between the concussion and the appearance of pressure symptoms: somnolence, sopor, coma, death. Pareses and infrequent pulse are often present; and sometimes irritation symptoms precede the latter unconscious state. Compression symptoms may occur at any time from fifteen minutes to eleven days after the commencement of the hæmorrhage. (2) Hemiplegia on the side opposite the injury. This is explained by the position of the artery exactly over the motor-centres for the arm and leg. Isolated paralysis of the leg is never observed, but only paresis when the arm is paralyzed; or both may be similarly affected at once. Convulsions may precede the affection. The author does not consider the cases of collateral hemiplegia sufficiently authenticated. (3.) Changes in the pulse—infrequency and hardness, generally increasing; sometimes the pulse becomes frequent at the last (paralysis of the pneumo-gastric nerve). (4.) Anomalies of respiration—slow, embarrassed, stertorous breathing. (5.) Vomiting. (6.) Changes in the pupil; generally speaking dilated pupils point to considerable pressure; the pupil on the side of the hæmorrhage is dilated and does not react. (7.) Unilateral impairment of sensation (observed in seven of the cases). (8.) Aphasia. (9.) Disorders of the bladder and rectum. (10.) Automatic movements, and lying always on one side (3 cases). (11.) Rise in temperature (the highest being 42.6° C.)

The *diagnosis* is sufficiently accurate if the first four of these symptoms are present, whether there be a lesion of the skull or not, or even if there be one on the opposite side.

Aphasia points to an extension of the hæmorrhage toward the front, disorders of sensibility to one behind, paralysis of the third pair of nerves to one towards the base of the skull. Crushing of brain-matter, inflammatory conditions, even congestive hyperæmia, may cause errors of diagnosis.

The *prognosis* is unfavorable, though not hopeless. Eighty-nine and twelve-hundredths per cent of the cases treated expectantly died. Simple contusions give a far better prognosis.

The *treatment* must fulfill two indications, to stop the hæmorrhage and to relieve the brain from pressure. The question of ligating the artery and disinfection of the seat of the hæmorrhage, and the point of tying the vessel are next considered and the line of treatment summed up as follows: Operative treatment is indicated (a) in cases of hæmorrhage through a wound of the skull, (b) in all cases of compound fracture, (c) in cases of sub-cutaneous fracture of the skull when the meningeal artery is ruptured, especially when the rupture occurs on the side of the injury, or even when there is no fracture. (d) The hæmorrhage is to be stopped by means of a ligature or with a suture; in case these methods are impracticable tamponade with iodoform gauze is recommended. (e) The main object in operating is to entirely remove the extravasated blood and to thoroughly disinfect the cavity which it occupied.—*Deutsche Zeitschr. f. Chirg.* Bd. 21, Hft. I and III. Bd. 22, Hft. II.

II. PARALYSES OF THE MUSCLES OF THE LARYNX AFTER EXTIRPATION OF THYROID TUMORS. By Dr. FR. JANKOWSKI (Heidelberg). Removal of goitrous tumors having become more frequent of late, owing to the diminished mortality-percentage of this operation, the author has been enabled to study more particularly one of the sequelæ attaching to such operations, namely, paralysis of the laryngeal muscles.

He first gives a case where a goitre was removed without improving the impaired phonation; one year later paralysis of the posterior crico-arytenoid muscles was observed, which eventually yielded to electrical treatment and subcutaneous injections of strychnia.

And after enumerating in tabular form all the eighty-seven cases (among them eight hitherto unpublished ones) in which, out of the 620 extant ones, laryngeal symptoms obtained, only forty of which, however, were examined with the laryngoscope—he proceeds to discuss the symptoms and pathology of laryngeal paralysis, dividing them into symptoms of phonation and of respiration. His material is represented by thirty-two cases of the former class, eleven of which are mixed in character and six of purely respiratory disorders.

He concludes that removal of a goitre may improve or impair the voice, and that such disorders of phonation may appear immediately or some time after extirpation. The cause of such injury of the voice may be primary or secondary; in either case lesion of the nerves occasions the disorder, the laryngeus inferior or the recurrent nerve being wounded.

After section of the trunk of the recurrent branch complete paralysis of the same

side of the larynx results ; if only branches are injured pareses ensue. Other injuries occasion similar effects, as ligating the nerves, compressing, stretching, tearing or dissecting them out. Hæmorrhages suffice to compress them. Inflammation of the larynx frequently results from surgical treatment, irrigation with carbolic acid solution or mechanical violence. Secondly, nerve lesions (inflammation, degeneration) may result from cicatricial pressure. Other cases again are pathologically quite inexplicable and the author supposes that the removal of the thyroid gland itself is the sole cause of them, the physiological function of this organ being yet unexplained.

In the further course of the affection, these paralyses may either recede, or they may remain in statu quo ; an apparent improvement may be occasioned by development of the muscles on the opposite side. Electricity is of use in the treatment. The prognosis is more favorable in cases of nerve stretching and inflammation ; but even after section of the nerve restitution is possible, though it does not always take place. Death may ensue after severing the nerve (eight cases). Cicatricial pressure is very unfavorable though rare ; still recovery is not impossible.

Purely respiratory paralyses are more rare, only seven cases being extant in all.

Respiration may be disordered immediately after the operation or later on, while phonation remains unimpaired or even improves. Injury to the recurrent nerve may cause embarrassment of respiration, by affecting the posterior crico-arytenoid muscles, the dilators of the larynx. Bilateral paralysis must be referred to the pneumogastric. The causes of these lesions are similar to those mentioned above. Tracheotomy is frequently necessitated. The prognosis is less favorable than in the other cases, because the affection is more persistent ; indeed, recovery is only recorded in a single case ; and the patient's condition is always critical.

In conclusion the author adds an index of the literature of the subject and also seven new cases of affections of the larynx, three operative ones of Czerny, of Heidelberg, three of Baumgärtner, of Baden-Baden, and one of Kœnig, of Göttingen, without remarks.—*Deutsch. Zeitschr. f. Chirg.* Bd. 22. Hft. II.

W. VAN ARSDALE (New York.)

III. TRANSPLANTATION OF A RABBIT'S EYE TO A HUMAN ORBIT. By H. W. BRADFORD, M.D. The patient, a man æt. 35, was the subject of atrophy of one eye, the result of an injury received during childhood. The stump having been removed, the recti muscles being divided close to the globe and held by sutures, the optic nerve treated in the same manner—the latter suture passing as nearly as possible through the centre of the nerve—a rabbit's eye, whose iris nearly matched that of the patient, was enucleated with care, the recti tendons being divided close to their insertion, the optic nerve cut at about 8 mm. from its sclerotic entrance, and both the patient's orbit and the rabbit's eye bathed in egg-albumen ; the nerves were then sutured together, the patient's recti fixed by sutures to the subconjunctival tissue and his conjunctiva attached to a band of conjunctiva which had been left about the rabbit's cornea, the eyelids closed, dusted with iodoform and a pad of absorbent

cotton and a flannel bandage applied. The nerve suture was withdrawn on the seventh day, with those of the superior and internal recti, that attaching the external rectus having already sloughed off and allowed the muscle to contract, drawing a part of the conjunctiva with it, exposing the subjacent sclerotic. The suture of the inferior rectus sloughed away by the twelfth day. On the eighteenth day from the operation the conformation and tension were good, the cornea had become cleared sufficiently to allow the iris to be distinctly seen and was improving; the exposed sclerotic was nearly covered and the ocular movements, in all directions, good. Vision was not expected and the desired cosmetic effect seemed to have been excellently secured.—*Boston Med. and Surg. Jour.* 1885. Sept. 17.

IV. CASES OF RECOVERY AFTER FRACTURE OF THE VERTEBRÆ. By J. D. STRAWBRIDGE, M.D., (Danville, Pa.). Patient was struck by a locomotive, causing a fracture of the third cervical vertebra through the bifurcation of the spinous process and the pedicle on the left side, with displacement. Reduction was obtained by traction, and a plaster splint applied to the back and sides of the neck, extending from the shoulders up under the ears and the back of the head. The splint was removed by the patient four weeks later, but it had to be reapplied and worn for three weeks more, when it was permanently laid aside, and, fifty-three days from the date of the injury, the patient was discharged, cured.

A second case was crushed in a mine, the bodies of the seventh, eighth and ninth dorsal vertebra being crowded into one another and the sixth and tenth injured. The heads of the eighth, ninth and tenth ribs were dislocated on the right side and the ninth and tenth on the left. The spine from the sixth to the tenth vertebra projected, forming nearly a semicircle. The patient was immobilized on a bed constructed for the purpose and pads applied to keep up moderate pressure on the necks of the dislocated ribs. This was continued thirteen weeks, at which time he was allowed to move in bed and soon after to sit up. Five months from the receipt of the injury he was discharged, cured. There was no paralysis nor symptoms of spinal trouble, but there was reduction in stature and deformity of the spine.—*Phila. Med. News.* 1885. Oct. 10.

J. E. PITCHER, (U. S. Army.)

## Chest and Abdomen.

I. LATERAL LAPAROTOMY. By Dr. POLAILLON (Paris). In certain cases where the median operation of laparotomy has been performed for intestinal obstruction considerable difficulty has been experienced in closing up the wound, owing to the very great distension of the intestines with gas. Sometimes the manipulation of the intestine in trying to reduce it, and the puncture of its walls to allow the gas to escape, has been a serious complication of the operation.

In such cases Dr. P. has found that an incision in the inguino-iliac region, parallel with the fibres of the external oblique, has been much less liable to these objections. The reason of this he believes to be (1) because the lips of the wound tend to come together in virtue of their direction; (2) because at the side the action of the dia-

phragm in producing downward and forward displacement of the intestines is less than it is in the middle line.

It has been found easy to make an incision sufficiently large to admit the hand. The deep epigastric artery, or some of its branches, is generally divided but can be easily secured with ligatures. In cases where there is no clue to the site of the obstruction, the median incision is recommended, but where either pain or swelling point to a lateral situation of the obstruction, the lateral incision has the advantage of being more over the site of the obstruction, of facilitating the closure of the wound, and of being better adapted for the formation of an artificial anus, should the state of the bowel require it.—*Gaz. Méd. de Paris.* 1885. V. April 25.

II. NOTE ON THE VALUE OF "THE DIAGONAL LINE" IN THE DIAGNOSIS OF DISTENSION OF THE GALL-BLADDER. By Mr. JOHN W. TAYLOR. In cases of distension of the gall-bladder, where the diagnosis is otherwise obscure, Mr. Taylor has found "an important aid to diagnosis" \* \* \* "in the recognition of the diagonal line in the direction of which the gall-bladder enlarges. This is to be traced from the normal position of the larger end of the gall-bladder (near the tip of the cartilage of the tenth rib on the right side) to the opposite side of the abdomen, crossing the middle line slightly below the umbilicus." By tracing the long axis of certain obscure abdominal tumors to this line Mr. Taylor has been much helped to arrive at their proper diagnosis as that of cases of distended gall-bladder.—*Brit. Med. Jour.* 1885. April 11.

III. ABDOMINAL SANGUINEOUS CYST; ASPIRATION; RECOVERY. By Dr. SINCLAIR (Dundee). This case is of interest from the unusual nature of its contents and from the uncertainty of its mode of origin. A smooth swelling appeared near the umbilicus of the patient, an intemperate man, a flax-dresser, two months before admission. It had grown rapidly, till it occupied a large part of anterior and right side of the abdominal wall, in which it appeared to be situated. No fluctuation impulse nor vascular bruit could be detected. With the aspirator 60 ounces of fluid were withdrawn and in fourteen days the patient left the hospital cured. The fluid was of a dark sherry color, specific gravity 1020, containing nearly 50 % of albumen, abundant red blood corpuscles, and some amorphous masses. No echinococci nor hooklets. A year after dismissal patient was in good health, but with some indications of reaccumulation of the fluid.

The tumor was considered to be extra-peritoneal, probably traumatic in its origin. Several other cases of sanguineous abdominal cysts are referred to, but Dr. Sinclair has not found reference to any one exactly similar.—*Lancet.* 1885. April 4.

IV. CASE OF PENETRATING BULLET WOUND OF THE ABDOMEN, WITH NUMEROUS PERFORATIONS OF THE INTESTINES, TREATED BY ABDOMINAL SECTION. By Mr. T. ANNANDALE (Edinburgh). On the 9th of March last, when two lads were playing with a loaded revolver, one of the chambers was accidentally discharged and struck one of them in the abdomen. He put his hand over the spot and walked

about 100 yards to the nearest house. A temporary dressing having been applied he was conveyed to the Infirmary and was seen by Professor Annandale at once, about an hour after the accident had happened. He was found to be suffering from slight general shock and to be complaining of a little pain in the region of the abdomen and pelvis, but was perfectly sensible. It was found that the bullet had penetrated the clothes over the lower part of the abdomen, and had wounded the abdominal wall  $1\frac{1}{2}$  inches below and  $1\frac{1}{2}$  inch to the left of the umbilicus, the textures and tissues round the bullet track being scorched. On inquiry it was found that the bullet was conical,  $\frac{1}{2}$  long by  $\frac{1}{4}$  inch in breadth at its base. The patient was put under chloroform and a longitudinal incision made so as to include the bullet-wound. On careful dissection the peritoneum was seen to be perforated, so the incision was enlarged and abdominal cavity freely opened. It was found that the bullet had penetrated the alimentary canal seven times—by three openings close together in the small intestines ( $3\frac{1}{4}$  feet below the duodenum, as shown at the post-mortem examination afterwards) by two openings in the descending colon and by two in the rectum; there was also a large vein wound in the mesentery. The intestinal wounds were “stitched by means of a continuous suture of fine catgut, after Lembert’s method,” and the wounded vein was ligatured also with catgut. No trace of fecal extravasation could be detected. During the operation the exposed intestines were protected by towels wrung out of warm corrosive sublimate lotion (1-2000). The abdominal and pelvic cavities were sponged out with the same lotion, and the abdominal wound was stitched up with superficial and deep sutures, no drainage being put in. The patient did well until early next morning, when he became restless, complained of abdominal pain and began to sink. This continued till his death at 12 noon, i. e., the day following the accident.

At the post-mortem examination signs of peritonitis were seen. The wounds in the rectum and colon resisted a powerful stream of water passed through the intestinal canal, but a slight leakage occurred where the small intestine was wounded. The bullet was found in front of the right ischial spine. There was no sign of fecal extravasation in the peritoneal cavity.

Professor Annandale believes that where there is any sign of sepsis it would be better in future to insert a drainage tube.—*Lancet*. 1885. April 25.

V. INTERNAL STRANGULATION OF SMALL INTESTINE; LAPAROTOMY; CURE. T. C., æt. 17, porter, admitted July 23, 1884, to the Hôpital de la Pitié. The patient had never previously been laid up. For eight months before admission he had had an easily reducible inguinal hernia, the size of a pigeon’s egg, on the right side. He had worn no truss. On the 15th of July he felt acute pain in the region of the hernia, spreading over the whole abdomen, the hernia being at the time irreducible. A few hours afterwards he was able to reduce it, and it did not again return. On the 16th of July he began to vomit green and bitter material. This lasted for several days, the stomach meanwhile became distended. The last stool was on the 15th of July. Enemata had been the only means employed to cause the bowels to act.



When seen (eight days after symptoms had begun) he had the appearance of hernial cholera ("du choléra herniaire"); eyes sunken and surrounded by a dark ring; face pale, cheeks slightly red. Great prostration, tongue pale, but not dry. Pulse regular and full 84. Temperature  $39^{\circ}$  ( $102^{\circ}.2$  F.) Respiratory and urinary systems normal. Abdomen inflated and globular. No prominence pointing to special distension of either great or small intestine. Fæcal vomiting but without much smell. Constipation and absence of passage of gas by anus complete. There was no trace of the former hernia and no apparent cause for the obstruction.

*Operation.*—Two fingers' breadth above the fold of the right groin and parallel to Poupart's ligament, an incision 8 to 10 centimetres ( $3\frac{1}{2}$  inches) in length was made, and the parts were carefully dissected down to the deep epigastric artery which was ligatured and divided. When the peritoneum was opened about 50 grammes ( $1\frac{1}{2}$  ounces) of yellow serous fluid escaped. The internal abdominal ring was felt from the wound with the finger to be quite free. The wound was next enlarged so as to admit the hand, and then a firm band or bridle was recognized on the left side, passing from the inguinal region towards the umbilicus. Although a sac of peritoneum existed between the band and the abdominal wall there were no coils of intestine within it, but on pulling out the small intestine coil by coil, a part was soon reached which bore evident traces of having been recently strangulated. Dr. P. thought that the strangulation had probably been within the sac. The intestines were sponged with carbolic lotion and replaced. The wound was sewn up. During the operation a carbolic spray was used, and a Listerian dressing, covered over with wadding, was applied afterwards. No attempt was made to divide the obstructing band for fear of hæmorrhage, which might have proved very troublesome. The patient made an excellent recovery and left the hospital cured on the 26th of August.—*Gaz. Méd. de Paris*. 1885. April 25. CHARLES W. CATHCART (Edinburgh).

VI. RECOVERY AFTER LAPAROTOMY FOR ILEUS. By Dr. HENRY F. BEAM (Johnstown, Pa.). A lady, æt. 48 years, had been confined to bed for two months, suffering from an obscure trouble. She had jaundice, the pulse was small and rapid, the temperature was  $101^{\circ}$  F., the patient suffered intense pain, and had fallen away forty pounds in weight. For three days she had had occasional attacks of stercoraceous vomiting. Palpation of the abdomen caused great pain, especially in the right iliac region, where there was a prominence resembling a hernia, beneath which could be felt a hard, round substance. Attempts to move the bowels by enemata were unsuccessful. It was finally determined to operate, and accordingly, chloroform having been administered, an incision two inches in length was made over the point of the swelling. The ileum was opened at its point of junction with the cæcum, and the knife immediately struck a hard body. The incision being prolonged, a calculus the size of an English walnut was removed. This was found on section to consist of a small nucleus, the size of a buckshot, surrounded with concentric layers of a material resembling lime, about one-sixteenth of an inch in thickness. The patient made a good recovery.—*The Medical Record*. 1885. Oct. 17.

VII. LIMITATIONS OF COLOTOMY IN DISEASE OF THE RECTUM. By C. B. KELSEY, M.D., (New York). Combats the opinion of Bryant that "in all cases of cancerous stricture of the rectum or colon, including the annular, right or left lumbar colotomy is strongly to be advocated" to relieve suffering, retard progress of the disease and prolong life, the operation being done before obstruction ensues. Cites eleven cases of rectal cancer to show that Bryant's rule is too broad and gives the following indications for the operation:

1. In congenital malformations of rectum or anus in children in which a tentative operation in the perineum has failed to reach the rectal pouch.
2. In intestino-vesical fistula.
3. In tumors occluding the rectum which can not be relieved by any other means—dilatation, division, hot water or electrolysis.
4. In non-cancerous, simple or specific stricture and ulceration of the rectum (with or without fistulae), where the disease can not be relieved by proctotomy<sup>2</sup> or dilatation or division of the fistula and local treatment of the ulceration.
5. In cancer where the disease can neither be removed nor the passage re-established, and where death is probable from obstruction—except in cases where the immediate dangers of the operation more than counterbalance any good likely to be gained by it.
6. In volvulus or intussusception of the colon or sigmoid flexure where reduction by the aid of laparotomy has been found impossible.—*Am. Jour. Med. Sci.* 1885. October.

## Genito-Urinary Organs.

I. THE TREATMENT OF ACUTE EPIDIDYMITIS WITH SUBNITRATE OF BISMUTH. By Dr. J. A. COMINGOR (Indianapolis). For several years and in many cases, both in hospital and private practice, the author has treated this affection with subnitrate of bismuth, with excellent results. Under its application pain is speedily relieved and tenderness and swelling subside in a short time. Its action is uniformly beneficial. It is used as follows, to-wit: Bismuth in indefinite quantity, water to make a paste about the consistence of thick cream, and with a large camel's hair brush paint the scrotum two or three coatings and repaint at intervals several times daily. To make the directions more definite, take bismuth and water in equal parts, mix, and apply as above. For the purpose of taking the weight off the cord and blood-vessels, some sort of scrotal suspension should be used; if the ailment is severe enough to bed the patient, a broad strip of adhesive plaster or bandage fastened across or around the thighs, with sufficient padding under the scrotum and contents to elevate above the level of the body to favor the return of blood, will be found serviceable.—*The Med. Record.* 1885. Oct. 17. J. E. PILCHER (U. S. Army.)

II. EXTRA-PERITONEAL PARTIAL RESECTION OF THE BLADDER FOR CANCER. By Prof. G. VON ANTAL (Budapesth). A. believes that epicystotomy, though it has been done but nine times for removal of tumors, is far preferable to Thompson's fa-

vorite median operation. In no one of the nine cases was the bladder-wall, properly speaking, resected, and A. finds but one case (Sonnenburg's) where this has been done—the patient dying four weeks later of exhaustion.

A.'s patient was a man *æt.* 61 years, who had suffered for two years from urinary troubles. For a year the urine had contained blood, though never any characteristic carcinomatous elements. Operated April 23, 1885. After provisory disinfection of the bladder it was filled with 250 ccm. of salt water and a colpeurynter introduced into the rectum; yet on opening the abdominal wall the peritoneal fold was scarcely 1 cm. above the symphysis. This was pushed and held back and the bladder opened. The cancerous nature of the growth and its seat at the crown of the bladder led him to resect the bladder-wall. To avoid opening the peritoneal cavity the peritoneum was prepared off from the upper and partly from the posterior walls. A third of the entire bladder was then removed. Altogether seven bleeding vessels were tied in the vesical walls. The resected edges were united by sublimated silk; two knee-shaped hard rubber tubes in the lower angle of the wound; permanent irrigation of bladder with thymol-solution. The abdominal wound was likewise united except at its lower angle. No fever. Irrigation stopped on sixth day—a soft catheter remaining in the urethra and a long drain in the wound. Most of the urine passed by the drainage tube, which was withdrawn on twelfth day. After scraping off the granulations the wound healed by the seventeenth day. Patient recuperated fast. Urine now clear. Bladder capacity 200 to 300 ccm., and sufficient for three to four hours.—*Centbl. f. Chirg.* 1885. Sept. 5. No. 36.

W. BROWNING (Brooklyn).

III. RUPTURE OF THE BLADDER. By Dr. N. KNOX. This case illustrates the difficulty of diagnosis which is often met with in rupture of the bladder. On 27th December last the patient, *æt.* 30, when drunk, was knocked down and kicked in the abdomen. He lay on the floor all night. Next morning he could not make water and was seized with severe vomiting. On the morning of the 29th a surgeon was called in and by patient's account drew off about two pints of urine with a catheter. On the 30th inst, patient was removed to the Royal Infirmary, still suffering from complete inability to pass water and pain over the whole abdomen. He was in a state of collapse. There were no external traces of injury. The bladder was not distended and only six ounces of bloody urine were drawn off by the house surgeon. The abdomen was not tender, nor were the legs drawn up. Severe vomiting came on soon after admission, and lasted during the evening. Patient stated that he had suffered for years from stricture. Next day patient weaker but vomiting had stopped, and abdominal pain less. Throughout the day patient four times voluntarily passed a small quantity of urine. At evening visit the house surgeon drew off with the catheter about 20 ounces of urine. All the urine contained blood. At midnight patient sank and died, having a short time previously passed a small quantity of urine involuntarily.

Post-mortem examination revealed a vertical intra-peritoneal rupture  $1\frac{1}{2}$  inches

in length on the posterior surface of the apex of the bladder. A blood-clot occluded the opening and extended on to the sides of the bladder. The bladder itself was rather larger than usual and contained urine. The peritoneum generally was congested and showed a few spots of lymph here and there. No trace of urine was to be found within the peritoneal cavity. The explanation given is that the bladder, when distended, was ruptured by a kick, and the urine escaping into the peritoneal cavity caused the pain, vomiting and collapse; that this was then drawn off by the surgeon on December 29 by the catheter having passed through the rupture; that thereafter there was partial suppression of urine from the shock, and meanwhile that the rupture was blocked by blood-clot and inflammatory action, which prevented further escape and allowed a certain power over the bladder to be regained. Dr. Knox believes that a certain amount of urine must have been absorbed by the peritoneum. During life the symptoms were considered to be due to over-distension and consequent injury to the bladder in a patient suffering from stricture, with injury to some of the abdominal viscera and slight peritonitis. When such cases are diagnosed in time, Dr. Knox advocates abdominal section above the pubes at once, cleaning out the peritoneal cavity, stitching the wound in the peritoneum with catgut, and freely draining the bladder by median urethrotomy. The bladder is to be stitched with chromic catgut so that the adjacent serous surfaces are in contact.—*Glasgow Med. Journ.* 1885. May. C. W. CATHCART (Edinburgh).

## Tumors.

I A FURTHER CONTRIBUTION ON NEOPLASMS OF THE MALE BREAST. By Dr. B. SCHUCHARDT (Gotha). In continuation of his previous article (*v. ANNALS*, vol. I, p. 71) S. gives a large number of cases, mostly German, which he has since been able to collect. These are derived, for the most part, from answers to the request in his first article and to inquiry addressed to the principal surgeons, hospital directors (medical) and pathologists of Germany and Austria. He has thus been able to add 134 to his previous 272 cases, making a total of 406. Of this total fifty-eight were not heterologous and 348 were heterologous, principally carcinomatous. But 219 of the latter are described at all in detail.

As to age (stated in 160 cases) two were under 20 years, seven between 20 and 29, fifteen between 30 and 39, forty between 40 and 49, forty-five between 50 and fifty-nine, thirty-seven between 60 and 69, thirteen between 70 and 79, and one was 84.

Of 131 cases it is known that sixty-three were on the right, sixty-five on the left, and three on both sides. The duration was, in the ninety cases where it is stated, from one-fourth to eighteen years. It is known that 127 were operated and twenty-one not. In seventy-five of ninety-nine cases the axillary glands were infiltrated, in twenty-four not.

Contusions and the like are given as the cause in twenty-five cases.

Of the whole 406 cases, 155 were British, 124 German, sixty-four French, thirty-

one Austrian, nine North American, nine Italian, four Danish, two Hollandish, two Belgian, two Swiss, and one each Portuguesish, Swedish, Russish and Japanese.

Although S. has found twenty-six cases of echinnococcus of the breast, they were all in females.—*Arch. f. klin. Chirg.* 1885. Vol 32. Hft. 1.

## Bones, Joints, Orthopedic.

I. ON PRIMARY EXTIRPATION OF THE HEAD OF THE FEMUR IN DISLOCATION OF THE HIP COMPLICATED BY FRACTURE OF THE NECK. By Dr. C. WIPPERMANN (Baden). A woman æt. 34 years was admitted at Czerny's clinic with an old dislocation of left hip. On an unsuccessful attempt at reduction three months after its recurrence the femoral head was broken off. Owing to the gradual development of an abscess from this, an incision was made five weeks later and the head removed. Gradual recovery, though she still has to go on crutches. He thinks that in this case immediate removal of the separated part would have been preferable.

W. has collected thirteen other cases of like luxation and fracture. One-half of the fourteen were primary fractures, the other secondary, from attempts at reduction. It is known that two cases of extra capsular fracture reunited firmly, while in two of three intra-capsular necrosis followed. A primary fracture here has more chance of reunion than a secondary produced by attempts at reducing an old dislocation. If in the latter case it be also intra-capsular there is little probability of reunion.

He concludes that when fracture as well as dislocation result immediately from the injury, coaptation of the bone ends should be tried, with a view to securing their reunion. If, however, it occurs in attempting reduction we should endeavor to distinguish between those wholly intra-capsular and those not or only partly so; in the latter case we may still hope to get union, but in the former a more rapid cure can probably be secured by immediate extirpation of the separated articular head.—*Arch. f. klin. Chirg.* 1885. Bd. 32. Hft. II.

II. OPERATIONS ON THE SMALL TUBULAR BONES FOR ACUTE AND CHRONIC OSTEOMYELITIS. By Prof. F. PETERSEN (Kiel). 1. *On total extirpation of the clavicle in infectious osteomyelitis.* In January, 1883, a 17-year old ship's carpenter presented himself eight days after the onset of osteomyelitis of the clavicle. The point of greatest swelling towards the sternal end was incised and much pus let out. The bone was for the most part bare and could be easily dislocated at the sternal end; slight twisting served to free its acromial end also, where it was readily removed. Counter-incision over the acromial joint. A thick drainage tube replaced the bone. T. that evening was 39.2°, then for four days subnormal. Suppuration was at first great. Drain removed on the sixth day. The bone had entirely regenerated in four weeks.

Expectant treatment in another case—metacarpus and first phalanx of right thumb—did not lead to new formation of bone but left the part useless.

In an osteomyelitis of the first phalanx of the index finger; early removal. A very useful finger resulted, though slightly shortened and a little stiff. He therefore

pleads for early removal of the sequestrum before the bone-building periosteum has been much injured. A much earlier cure is thus effected. This of course refers only to the bones mentioned in the title.

2. *On the operative treatment of chronic osteomyelitis of the first metatarsal bone.* The question here is as to advisability of saving the big toe. His experience and that of at least some others goes to show that scraping out the diseased part or subperiosteal removal of the said bone does not give better cosmetic results or a more useful foot, nor yet as speedy a cure as removal of both toe and diseased bone. After the latter operation a suitable shoe could be early fitted to the resulting flat-foot—raised along its anterior inner border and supplied with a convex steel spring against the plantar arch.—*Arch f. klin. Chirg.* 1885. Vol 32. Part II.

W. BROWNING (Brooklyn).

III. PERIOSTEUM-GRAFTING. By C. W. TRUEHEART, M.D., (Galveston, Tex.). Three and a half inches of the central portion of the clavicle having been carried away by a gunshot, and, after six or seven weeks, no possibility of osseous or ligamentous union of the bone being apparent, the new tissue formation in the track of the bone and the cartilages on the ends remaining were removed. Small grafts of periosteum: with or without thin laminae of the underlying bone—each graft about the size of a large flax-seed—were removed from the superficial portions of the long bones of the legs and from the scapulae of dogs, with a short, stout resection knife, curved scissors being used for smoothly completing the section, and the entire surface of the excavated wound and the ends of the bone were set with grafts about  $\frac{3}{8}$  of an inch apart. The wound was dressed with perforated oil silk, covered with a compress of lint moistened with 2% carbolic water, held in place with adhesive strips. Seven or eight out of every ten grafts were efficient and from the sixth to the tenth or twelfth day the pale red of the periosteal tissue was seen to grow brighter and under a compound magnifying glass minute points of granulations with their loops of capillaries could be seen cropping out through and blending with the tissues of the grafts; a corresponding activity was seen in the surrounding granulations which arose about and covered in the grafts, leaving little sinuses—communicating with the surface of the wound—which soon became obliterated. At this time another set of grafts was applied. This was done three times in course of a month, and, the excavation having become fairly filled with granulations, skin grafts were applied and superficial cicatrization secured. Two months after the periosteum-grafting the  $\frac{23}{4}$  inch gap in the bone was found to be filled with a tissue in all external appearance resembling bone. The patient suffered a simple fracture of the same clavicle some years later, which reunited like normal osseous tissue.—*N. Y. Med. Record.* 1885. Oct. 3.

J. E. PILCHER (U. S. Army).

IV. RESULTS IN TUBERCULOUS DISEASE OF KNEE-JOINT AT THE GETTINGEN CLINIC. By Dr. W. WILLEMER (Berlin). This mainly statistical contribution to the subject of tuberculous gonitis is of special importance in so far as it bears a relation

to Koenig's work on tuberculous affections of the joints. The cases forming the material which the author, a former assistant of Koenig, makes use of, were all treated at the surgical clinic of Goettingen, during a period of seven years, ending October, 1882, and were seen and adjudged by Koenig himself, and were therefore all treated from the same point of view.

The author followed up the cases after they had left the hospital as much as possible and omits all more recent ones as not having been sufficiently long under observation.

All operations during the period mentioned were performed with antiseptic precautions; but iodoform, which subsequently proved very satisfactory, was not introduced till towards the end of this period.

The number of cases treated is 174; the author refrains from giving any histories and merely publishes the figures.

He finds that males were more frequently affected with knee-joint troubles than females, and accounts for this fact by traumatisms, which, he concedes, play an important role in the etiology, though he cannot give exact statistical information on the frequency of traumatisms in the histories nor on the question of heredity. The occurrence of the disease, in reference to the age of the patient, is most frequent under ten years. The treatment consisted in dietetic measures and surgical interference; minor operations, tapping, scraping out and bandaging, sufficing in 30 per cent of the cases; severer operations, amputation, resection, being performed in 65 per cent. No internal medication was used. The results point to resection as the most preferable method. Forty-seven per cent treated by the latter method were completely cured, against 40 per cent of the others; while 40 per cent of the cases were cured in all, 30 per cent died, and 10 per cent healed after amputation.

The prognosis is more unfavorable when suppuration is present, severe operations being necessitated and less favorable results being achieved.

As regards the subsequent growth of the limb it is not till after a period of about seven years that a difference can be noted. The leg may be either considerably (3 cm.) shorter, or very little shorter or longer than the unaffected one. In the first case contractions are frequently present; indeed the author is inclined to believe that the contraction is the cause of the shortening of the limb on account of the circulation being impeded. In case of shortened limbs the osseous focus was generally found in the epiphysis of the tibia, but, contrariwise, when the limb was lengthened, the focus was situated in the femur. The shortening found after resection was not greater than in unoperated cases.

The greater part of the resections were performed in the second year of life, the amputations mostly during the first. Complete recovery from the disease was not observed to take place before the second or third year of treatment, even under the most favorable circumstances. But even non-suppurative cases would often not heal till after ten or twenty years. Recurrences were quite frequently observed.

The mortality percentage amounted to 32 for operated and to 28 for non-operated

cases. The operation itself was the cause of death in 25 per cent; one case dying of erysipelas, six of septic affections, and two of carbolic acid poisoning. Sixty-two per cent of the cases died of tuberculous affections and 13 per cent of those treated by resection. Life can be proved to have been prolonged by operations in a number of cases.

Dividing his material into three groups—1. Cases under ten years of age; 2. Between 10 and 20; 3. Those over 20—the author proceeds to give statistical data of each group separately. Thus he finds that severer operations were more frequently necessitated after the tenth year; that the disease was much more frequently (41% to 8%) non-suppurative before the tenth year. The resections were very frequently indicated by contractures (60%) during the first ten years. Anatomically speaking osseous foci were more frequent in the first group; in the second group primary synovial affections occurred as often as primary osseous ones; in the third group, in cases commencing after the twentieth year, osseous foci prevailed (two-thirds of the cases). Complications with tuberculous diseases of internal organs increased in frequency in the third group (15, 20, 37) but those more local ones of the bones, skin, etc., remained about the same (17, 16, 14%).

The final results in the three groups, in percentages, were as follows: Complete cure, 50, 39, 27; incomplete or uncertain, 32, 6, 12; cure by amputation, 3, 16, 16; deaths, 15, 39, 45.

The frequency of complete cure, with or without an operation, is but half as great after twenty years as it was in the first ten; while the death-rate is trebled.—*Deutsch. Zeitsch. f. Chirg.* Bd. 22. Hft. III and IV.

V. ON THE FINAL RESULTS OF RESECTIONS OF JOINTS. By DR. BERTHOLD KORFF (Würzburg). The author reports from the surgical clinic of Würzburg on the issue of 104 cases of excision of joints performed by Prof. Maas in the surgical clinic of Freiburg, Baden, having been enabled either to examine the cases previously or at least to receive accurate accounts of their status. He makes no mention of the technical details of the operations, but confines himself to giving, for the most part in a series of exhaustive tables, the results achieved, taking only the mode of dressing followed into consideration. All the cases, comprising three excisions of the shoulder, thirty-three each of the hip and knee, nineteen of the elbow, were treated after antiseptic methods. The first group, of twenty-nine cases, were treated after the typical Listerian method, the second, of fifty-three cases, with acetate of aluminium, the third, embracing twenty-two cases, with corrosive sublimate and common salt, the wounds being dressed with gauze prepared by soaking 1,000 parts common salt and 100 to 200 parts glycerine—the dressing being applied in a moist condition. The operations were always conducted under a spray; occasionally irrigation being employed as well.

Thirty-nine cases ended fatally, death being caused in thirty-four of the cases by tuberculous affections; in two by septicæmia, in one case by erysipelas. Both of these latter cases occurred during the use of the typical Listerian dressings.



The inferences drawn by the author are that the acetate of aluminium proved more favorable than the carbolic acid, but that the corrosive sublimate and salt surpassed both, as regards the course of wound-healing and the final restitution.

The observation is of interest that resection of the knee-joint in children under 14 years of age did not lead to any curvature of the limb, contrary to the views expressed by Volkmann and Koenig.—*Deutsch. Zeitschr. f. Chirg.* Bd. 22. Hft. I and II.

W. VAN ARSDALE (New York).

## Gynæcological.

I. THE CHOICE OF METHODS IN ABDOMINAL DELIVERY. By R. P. HARRIS, M.D., (Philadelphia). A comparison of the results obtained by the old Cæsarean section, the operation with Säger's (Leipzig) method of suturing the uterine wound and its simplifications—where by means of a welt secured by a superficial and deep suture, with or without the resection of a portion of the muscular coat, the peritoneal surfaces are brought into apposition—and by laparo-elytrotomy, with a closing reference to the Porro-Cæsarean section accompanied by tables of cases operated upon by the second and third methods. In New York and Brooklyn nine women and nine children were lost in eleven Cæsarean operations and in the balance of New York state seven women and five children in eight operations. Laparo-elytrotomy has been performed nine times in New York and Brooklyn, saving six women and five children; four of the six women saved were in labor respectively eight, eleven, sixteen and twenty-two hours, and the other two, four days and a week. Of the twelve cases, tabulated, operated upon by the Säger method and its simplifications, six women and two children and one of twins died, while six women and ten children were saved; the deaths were so complicated by external circumstances that no opinion can be formed as to the exact effect of the length of labor on the result, thus one case died after six hours' labor, while another recovered after thirty hours; very long continued labor would, other things being equal, be an unfavorable complication. Of the Cæsarean operations, six were operated upon on the first day of labor and but one was saved; the prognosis was "unfavorable" in ten of the eleven. In the laparo-elytrotomies, four were "favorable" and five "unfavorable" for operation; all of the favorable cases recovered. Of the Säger cases, six were favorable, all of which recovered.—*Am. Jour. Med. Sci.* 1885. October.

II. REMOVAL OF CALCULI FROM CYSTS OF THE VULVO-VAGINAL GLANDS. By A. VICTORIA SCOTT, M.D., (Philadelphia). The patient was a mulatto woman æt. 49 years, and passed the menopause six years previously. Three months after that epoch a swelling appeared in the right labium which finally burst, discharging bloody fluid. Later on a similar formation occurred on the other side, and thenceforth a series of abscesses succeeded one another on either side. A vaginal examination revealed two cysts connected with the vulvo-vaginal glands, with a hard eminence on either side. The patient refused surgical interference until seventeen months later, when an incision on the site of the tumors brought the knife upon a calcareous

body contained within a capsule, the calculus being of a whitish color, round and smooth,  $\frac{3}{16}$  and  $\frac{1}{8}$  of an inch in diameter respectively. The removal of the calculi left fistulae which had not, at the date of the report, been obliterated, and would require special operative treatment. As far as is known, no similar case has ever been recorded.—*Am. Jour. Med. Sci.* 1885. Oct.

III. FOUR CASES OF TAIT'S OPERATION. By J. W. HYDE, M.D., (Brooklyn, N. Y.). The ovaries and Fallopian tubes were removed in these four cases, respectively, (1) chronic ovaritis of both sides, with salpingitis of the left side, complicated with hysterо-epilepsy; this case was rendered very difficult by the great extent of the adhesions, "all the viscera being matted together; irrigation with a 2% carbolized solution and, finally, naphthalinated dressings; recovery; menstruation persistent, in a gradually diminishing extent, thirteen months later; (2) painful and enlarged right ovary with prolapsed left ovary and very sensitive tubes; very pronounced asymmetry of the body, the entire left side presenting an appearance of atrophy; no adhesions; dressings as in the first case; recovery; (3) great tenderness of left ovary, right cystic; history of severe and prolonged attack of intermittent fever, followed by dysmenorrhœa of steadily increasing severity, complicated with attacks of localized peritonitis; salpingitis; adhesions of vast extent rendered the operation extremely difficult; the right ovary not discovered and supposed to have degenerated into a cyst which was ruptured and the walls of which could not be dissected away because of their adherence to the bowel; death thirty-one hours after the operation from unsuspected disease of the kidneys, which were found to be enlarged and subject to fatty degeneration; (4) painful menstruation, becoming at times muco-purulent and offensive, scarlatinal pyo-salpinx accompanied by great tenderness of the inguinal glands with tumefaction of the surrounding tissues at each menstrual period; uterine retroflexion; prolapsus of left ovary; no adhesions, menstruation in this case and in the second case ceased at once,—*N. Y. Med. Jour.* 1885. Oct. 17.

J. E. PILCHER (U. S. Army).

## REVIEWS OF BOOKS.

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THE COTTON-WADDING DRESSING AND ITS APPLICATION TO SURGICAL THERAPEUTICS [*"Du Pansement Ouaté et de son application a la thérapeutique chirurgicale"*]. By ALPH GUÉRIN, President of the Academy of Medicine, Honorary Surgeon to the Hôtel Dieu. With figures intercalated in the text. Paris: J. B. Baillière et Fils. 1885. 12mo. Pp. 392.

In this little book, Guérin relates in vivid and vivacious, but rather diffuse style, the history, development and applications of a dressing which has been so overshadowed by that of Lister, brought out about the same time and founded upon the same general principle, that it is little known beyond the limits of its birth place. The author claims to have held for many years that septic infection, consequent upon inflammatory processes, arose from influences extrinsic to the system of the patient, attributing it at first to the presence of miasms in the atmosphere, and, finally suspecting that it originated in the influence of ferments, germs, microbes present in the air, he undertook to devise a method to prevent the access of these germs to wound surfaces. Pasteur's famous demonstration of the absence of microbes in the air which had been filtered through a cotton plug in the mouth of a flask in which a vacuum had been previously created, was the foundation upon which the dressing was at last built up. Guérin conceived the idea that, if a wound could be so perfectly enveloped in cotton wadding as to prevent the access of air except through the meshes of the cotton, septic infection would be avoided and the most rapid healing secured. Lister sought to prevent sepsis by killing the germs: Guérin sought to obtain the same end by keeping them away.

It is a marked defect in the book that no description is given of the method in its general application; the reader can gain an idea of it only from diffuse descriptions of its application to numbers of special cases. The procedure as gained from these sources may be said to be as follows: All vessels having been ligatured with care, hæmostasis being complete and the wound thoroughly irrigated with a five per cent carbolized solution, it is covered with layers of cotton wadding rolled about the part affected and covering a large portion of the ad-

jacent surface so thick that, when bound down, pressure over the wound occasions no pain. The bandages are then applied, the first making but slight compression, in order to secure uniformity of pressure throughout each layer of bandage: others are then bound about the dressing, with gradually increasing tightness, until finally they are drawn with the entire strength of the wrist. It should be possible to strike with considerable force over the wound surfaces without occasioning the slightest tinge of pain. In case this is not secured at first, additional layers of cotton should be added until no painful sensations can be conveyed through the mass. After a time the bandages are apt to loosen. It is of vital importance to the success of the method that this should not occur to an extent sufficient to admit the air, and care should be taken to apply new bandages tightly over the former, as soon as any loosening is observed. The dressing, once properly applied, should be left in place for a period varying from ten days to several weeks and even months, according to the nature of the wound and the result desired. Great care is requisite in redressing a wound to avoid infection by exposure to an infected atmosphere.

While laying great stress upon the filtration of the air as the source of success, the author also attributes great benefit to (1) the elastic compression secured by the dressing, (2) the immobilization of the wounded parts and (3) the constant temperature. The elastic compression is certainly of great advantage and in no other way can it be obtained in so uniform, painless and constant a manner as in this; the same may be said of the immobilization of the wounded parts, while the constant temperature would also add to its efficiency.

The manner of application is also of vital importance to its success. In the hands of Guérin himself it has been uniformly successful in securing primary union in amputation and other operation wounds, while he acknowledges that some others have not obtained as good results, attributing the failure to incorrect application. Dolbeau applied the dressing for an amputation of the thigh. When it was removed, on the fifteenth day, he discovered, to his great consternation, that though the flaps had united by first intention, the severed end of the femur protruded from the centre of the stump between the flaps, which were firmly united to the periosteum. The dressing was eminently successful in securing primary union, and the unfortunate result could have been due to no other cause but an improper application of it. The importance of this point could alone justify the large amount of space devoted by the author to the details of the application of his procedure to special cases.

No drainage tubes are used, the author considering their action to

be that of foreign bodies, interfering with the healing process. In case there is a probability of need for drainage, a few strands of cotton twisted together are used for the purpose.

The value of this dressing is perhaps best illustrated in its application to extensive burns. Immediately upon its application the patient's suffering is relieved and he remains in comfort until it is removed. Cicatrization proceeds rapidly but not normally, for the cicatrix under the cotton-wadding dressing is soft and without excessive contractility, nor does it form a prominence on the injured part. A woman suffered a severe burn of the right breast, arm and forearm. To the arm and forearm the *pansement ouaté* was applied. It was omitted from the breast because of paroxysms of dyspnoea, which it caused, and a dressing of glycerine applied. Cicatrization of the limb was complete in about two months: the cicatrix was smooth, soft and on the same line as the skin, from which it could be distinguished only by its more rosy hue. There was not then, nor at any later period, any traces of contraction. The cicatrization of the chest under the open dressing, was, on the contrary, very slow, not being complete, even with the aid of grafting, until four months later; the cicatrix was then rough, raised above the level of the skin, with radiating ridges and contracted so strongly as to draw the nipple well over on to the side. The dressing seems to modify the growth of the newly formed tissue and keep it in the most favorable condition; by its compression diminishing local congestion and by the filtration of the air, precluding the access of septic germs. In this way the inflammatory action is prevented from affecting the new skin as soon as its elements appear and forming nodular tissue with the great contractility characteristic of it.

One of the most important applications of this dressing is in the treatment of arthritis, in this case the compression and immobilization which it secures being the source of its power. The writer can vouch for its utility here from his own experience. A case of arthritis, affecting the wrist joint had been under treatment several months by ordinary methods, without any improvement. Immediately upon the application of Guérin's dressing the pain ceased and the swelling began to diminish. The patient has worn the dressing for two weeks, during which time he has suffered no pain: the effusion seems to have been entirely reabsorbed, his total recovery is a matter of a very short time.

An objection to the method in practice is that it demands a very large amount of the cotton and of bandages and a not inconsiderable amount of labor in its application. This is more than counterbalanced, however, by the fact that renewals are very infrequent.

This method might have commanded a wider acceptance, however,

if it had not been promulgated just at a time when positive scientific tests were being applied to the merits of wound dressings, and when a deeper insight into the requirements of a satisfactory wound dressing had been gained. All that the dressing of Guérin can justly claim to accomplish is to protect a wound from gross external irritants, and supply equable compression and temperature. In many cases it will answer well, but in many classes of cases of the greatest importance it must be attended with disaster. The enthusiastic claims for it by its deviser may be taken with a great deal of allowance. The method has been before the surgical world for its judgment for fifteen years or more, and, notwithstanding the publicity and the authority which its practice in the wards of the Hôtel Dieu of Paris have given it, it has never come into any general use outside of the service of Guérin himself.

J. E. PILCHER.

II. TRACHEOTOMY IN LARYNGEAL DIPHTHERIA: AFTER-TREATMENT AND COMPLICATIONS. By ROBERT WILLIAM PARKER, Surgeon to the East London Hospital for Children, and to the Grosvenor Hospital for Women and Children. Second edition. London: H. K. Lewis. 1885.

The second edition of Mr. Parker's work on Tracheotomy in Laryngeal Diphtheria is more complete than the first edition, which appeared a few years ago. Since then he has increased his number of cases from twenty-one, with twelve recoveries, to thirty-two, with seventeen recoveries. The chapter dealing with the operation itself has been considerably added to, and a chapter on complications, with some well executed illustrations, is both interesting and instructive. The first chapter contains a brief history of tracheotomy and a few hints for the general treatment of diphtheria. Mr. Parker strongly recommends the avoidance of all depressants, especially antimony. He is a very firm believer in the local treatment. He does not give any great preference for one drug over another, but says; "I do not think the material used is a matter of first importance, it is rather the manner in which it is used and the thoroughness with which the infective products of the local lesion are got rid of, to which I should trust in any given case."

His directions as to the time when operative interference should be had recourse to are short, but to the point. He himself is guided by the breathing rather than anything else; difficulty in expiration being always an indication for immediate operation. He then gives some very useful aphorisms concerning this disease. Chap. IV. opens with a short account of the surgical anatomy of the parts concerned in

tracheotomy and then follow details of the operation itself. To the question, ought chloroform to be used? he gives a decided answer in the affirmative, only recommending that its administration should be gradually commenced. He lays great stress on the form of the tube used, condemning the quarter circle tube as not corresponding with the natural direction of the trachea. He has devised an angular tube and illustrates its advantages over the former by wood-cuts. Mr. Parker eulogizes the movable collar introduced by M. Roger as "one of the most important modifications the tube has ever undergone." In recommending the high operation rather than the low, he omits to mention an advantage the former possesses in facilitating the removal of membrane from the larynx. He deprecates the use of retractors during the operation, and strongly condemns the hook for fixing the trachea. To extract any secretion or membrane from the trachea, Mr. Parker has devised a very useful and safe tracheal aspirator. The chapter concludes with a brief account of some of the chief dangers of the operation and the means to be taken to obviate them. We cannot, however, quite agree with Mr. Parker when he expresses an opinion that there are no dangers in the rough handling of the interior of the trachea; and S. Goodhart, in his admirable work on *Diseases of Children*, has brought some of the dangers very forcibly forward.

He then passes on to details in the after-treatment. His suggestions have evidently been arrived at after some considerable experience, and there are many hints which will be of much value, especially to those to whom the nursery of tracheotomy is new ground. Among solvents Mr. Parker gives preference to soda solutions, and recommends their application by steam sprays as being more thorough than hand ones. Mr. Parker's little work has evidently been very carefully written and revised. We feel confident that it will prove of real value to many practitioners, and it should be especially useful to house-surgeons, who, as a rule, are chiefly responsible for the after-treatment of tracheotomies, and, indeed, frequently have to undertake the operation itself.

H. H. TAYLOR.

III. ON SOME COMMON INJURIES TO LIMBS, THEIR TREATMENT AND AFTER-TREATMENT; INCLUDING BONE-SETTING, SO-CALLED. By EDMUND COTTERELL, M.R.C.S., Etc. London: H. K. Lewis. 1885.

Mr. Cotterell has drawn attention to some simple injuries, but to some which are none the less difficult to treat. His book extols the treatment by movement as opposed to the treatment by rest.

He has endeavored to lay down the rules that should guide us in the use of manipulation and the indications which point to the necessity

for rest, and he has related some striking instances of the harm that may be done by injudicious movement.

We can hardly, however, agree with him that the cracks which are so audible are caused by the rupture of adhesions within a joint. This may sometimes be the case, but all dissections which have been made of limbs subjected to disease show that the joints are quite free, whilst the crack is caused by the rupture of adhesions outside the joint.

There is a curious statement on the subject of fractured patella to which we would draw attention, viz.: that a patient who was treated in 1868 for a fractured patella with Malgaigne's hooks, and was discharged with bony union, is discovered six years later to have two inches separation between the fragments. What evidence he would ask is there that bony union ever results after the use of Malgaigne's hooks. Nothing is commoner than to find the fragments which were close at the end of four months widely separated at the end of four years. Bony union, when it occurs, is always attended by the appearance of a considerable amount of callus, and after such union the fragments do not again get separated.

With these exceptions the book is both readable and instructive, and we can cordially recommend it.

W. BRUCE CLARKE.

IV. CANCER; A STUDY OF THREE HUNDRED AND NINETY-SEVEN CASES OF CANCER OF THE FEMALE BREAST, WITH CLINICAL OBSERVATIONS. By WILLARD PARKER, M.D. New York and London: G. P. Putnam's Sons. 1885. Pp. 105.

The title of this work must be sufficient to arrest the attention of every American surgeon. It has fallen to the lot of but few to record observations of so many cases of this disease; and the assurance which every one of us naturally feels that Dr. Parker's strong intellect would draw useful, practical deductions from such a large mass of material will not be disappointed. No claim is made for advanced histological or advanced histogenetic views; and the subject of diagnosis is purposely left unconsidered, the study being chiefly directed to etiology and treatment.

The careful observation of a single case of cancer in all its bearings clinically and anatomically, is very instructive; but the conclusions which a man of vigorous intellect and ripe judgment deduces from hundreds of cases carefully observed are certainly of enormous value, however much they may differ from preconceived and usually accepted notions. In this work the author has sought most diligently for light on the dark question of etiology.

Reasoning from the fact that barbarous and semi-civilized tribes are



comparatively free from cancer, as are also animals in a condition of freedom, and that it is most prevalent among people who live generously, and particularly among those whose habits are luxurious and who live freely upon highly seasoned and nitrogenous food, he concludes positively that diet has a causative influence of no small significance. These habits produce malassimilation and consequent sympathetic irritation of the skin and mucous membranes, and thus engender the malady. Intoxicating drinks cannot be included among the causes, nor can syphilis.

Anxiety, want of personal cleanliness, mental affliction—the latter with especial emphasis—all are included in the list of factors.

The chain of reasoning by which heredity is excluded as a cause is very ingenious and very logical, and, while we have not space in which to reproduce it here at length, we desire to call attention to it most particularly.

Local irritation, unphysiological habits of dressing, direct trauma, antecedent abscesses and their cicatrices, are all given their respective places.

As to therapeutics, it would follow naturally (and is specifically asserted) that these various causative influences should be eliminated. We are told of well observed cases in which intelligent regulation of diet together with due regard to hygiene has been followed by marked amelioration of symptoms and arrest of the progress of the malady. Early and radical surgical interference is considered to be now so generally conceded as to need no emphasis on the author's part.

The value of individual cases would, of course, be much enhanced if anatomical study of them had proved the diagnosis beyond cavil. Such cannot always have been the case, for the microscope in pathology was practically unknown here when Dr. Parker's work began. The cases are often so clear in themselves as to be wholly free from elements of doubt such as we have just suggested, but candor compels us to assert that this is sometimes not the case.

The writings of thirty years ago, when cancer was a varying clinical picture, cannot be safely transferred to the exact anatomical entity of to-day which bears the same name.

The tabular statement at the end is an evidence of great painstaking and honest labor.

The book is one of great value and interest, and we have said enough of it to show our appreciation of the original and striking lights in which the subject is held up to view.

G. L. PEABODY.











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Annals of surgery

GERSTS

